FINAL SUMMARY REPORT

CONTRACT NO. NAS8-5352

CONTROL NO. TP 3-84117 (IF)

CPB 02-1163-63

GEORGE C. MARSHALL SPACE FLIGHT CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

For the Period
May 1963 through May 1969

DEVELOPMENT OF VULCANIZABLE ELASTOMERS SUITABLE FOR USE IN CONTACT WITH LIQUID OXYGEN

ANNOTATED BIBLIOGRAPHY

October 1969

Peninsular ChemResearch
Calgon Corporation
Post Office Box 1466
Gainesville, Florida 32601

FINAL SUMMARY REPORT

CONTRACT NO. NAS8-5352

CONTROL NO. TP 3-84117 (IF)

CPB 02-1163-63

GEORGE C. MARSHALL SPACE FLIGHT CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

For the Period
May 1963 through May 1969

DEVELOPMENT OF VULCANIZABLE ELASTOMERS SUITABLE FOR USE IN CONTACT WITH LIQUID OXYGEN

ANNOTATED BIBILOGRAPHY

October 1969

Peninsular ChemResearch
Calgon Corporation
Post Office Box 1466
Gainesville, Florida 32601

APPENDIX

ANNOTATED BIBLIOGRAPHY

June 1963 through May 1969

This bibliography was prepared from references obtained mainly from Chemical Abstracts, but contains, in addition, references taken from a number of primary sources. Major emphasis was placed on references to fluorine-containing monomers and polymers and to thermal properties of all classes of polymers.

The great number of references in the categories covered necessitated selecting references which were considered to be of most significance to the present investigation. The choice of references is somewhat subjective, but it is felt that the cross-section given is a useful representation of the literature to date.

The references listed have been categorized with respect to the general subdivisions shown below. For the sake of brevity, no cross-referencing has been done; hence, where a paper was concerned with more than one sub-division the reference, in general, was placed in the category of greatest importance. Copolymers were placed in the earliest listed monomer category with the exception of the vinyl ethers and thioethers, the copolymers of which were included under the main heading of vinyl ethers.

INDEX TO APPENDIX

I. Reviews on Fluorine-Containing Polymers

Armstrong, C. S., C. A. 64, 17072b
Fluids and elastomers for low temperature heat transfer and hydraulic systems

Banks, R. E., Birchall, J. M., and Haszeldine, R.N., Monograph 13, 207-94 (1961). C.A., 56, 7483e (1962)
Polymers containing fluorine

Bergmann, E. D., Bull. Soc. Chim. France 1965, 2676
Aliphatic fluorine compounds, a review

Bikales, Norbert M., Encycl. Polymn. Sci. Technol. 7, 461 (1967)
CA 69 (8), 27801y.
A review, including definition and examples of the glass transition in polymers

Blackwell, J. W., C.A. 65, 13869c
A review of PTFE in engineering

Borisov, S. C.: Fluorine-Containing Elastomers,
RAE Library Translation 1010.

Bringer, Robert P., Encycl. Polym. Sci. Technol. 1967, 7, 204-19
C.A. 69, 19830s
Fluorine-containing polymers. Chlorotrifluoroethylene polymers. A review of prep'n., properties, and uses.

Brown, H. C., Encycl. Polym. Sci. Technol. 7, 179 (1967)
C.A. 69 (6), 19520r
A survey of fluorine-containing polymers, both condensation- and vinyl-types.

Ch'en, Tung-lin, C.A. 64, 3764g
Physical properties of fluoropolymers

Chenchung Ma, C.A. 61, 12089b (1964)
Free radical addition polymerization of fluoroalkenes. 39 ref.

Cooper, J.R. High Polym. 23 (i), 273-90 C.A.69(24), 97533m
Elastomers by radical and redox mechanisms. E. Fluorine-containing elastomers. A review with 53 references.

Coulter, D. J. B., C. A. 59, 14179f (1963)
Viton-a fluoroelastomer: properties and applications

Cox, A. P., C.A. 64, 14345d
A review on Teflon TFE and FEP

Fischer, H., C.A. 56, 6161g(1962)
Fluorine chemistry. V. Poly(tetrafluoroethylene)

Fitzgerald, J. E., Prod. Eng. 30, No. 6,23-5 (1959). C.A. 53, 23049e (1959) Soviet plastics

Galie, F. A. and Gilinskaya, N. S., C.A. 62, 13349a
Fluorocarbon elastomers review

Gall, J. F., ARSJ 29, 95-103 (1959). C.A. 53, 1411a (1959)

Gatza, P. E.; Mitton, Philip; Bickel, F.W.; Statz, M.W.: C.A. 68, 88008W; Rubber World, 157(5), 65-77 (1968) (Eng.), Evaluation of fuel-resistant elastomers for low temperature applications.
Physical properties of elastomers including fluorocarbons, fluorosilicones, acrylate rubbers are discussed.

Grobelny, Marian: C. A. 67, 32931g, Chemik (Gliwice) 20(3), 95-9 (1967) (Pol.), Fluorinated plastics. I. Plastomers.
A review with nineteen references on production, properties, and uses of fluorinated plastics.

Grobelny, Marian: C. A 68, 40707w, Chemik (Gliwice) 20(4), 128-31 (1967) (Pol.). Fluorinated plastics. II. Elastomers.
A review of elastomers known under trade names, Kel-F, Viton, Fluorel, Fluororubber IF4, Silastic LS-53, Silastic LS-63 and of poly(fluorobutadiene) and poly(fluorobutene).

Hauck, J. E., C.A. 64, 17834c
Review on low temperature elastomers

Hsi-Chun Hung, C. A. 61, 16279a (1964)
Chemistry of nitroso rubbers, 58 references

Kawamura, T., C.A. 63, 8485a
Review on recent developments in fluorine-containing polymers.

Kawamura, T., Kagaku to Kogyo (Tokyo) 18(6), 789-98
Recent developments in fluorine-containing polymers

Kirk-Othmer Encycl. Chem. Technol. 2nd Ed., C.A. 65, 13881c,d
Poly(CTFE) and poly(BTFE)

Kormity, P., C.A. 59, 15463 (1963)
Application of halogenated elastomers in chemical engineering

Kubouchi, Y., C.A. 55, 26807b (1961)
Fluorine resins and fluorine rubbers

Kullberg, Arne, C.A. 66, 3039x
Fluoroethane plastics, properties, and peculiarities. A review.

Lamm, Mme. G., C.A. 55, 20475i (1961)
Fluorinated elastomers

Landrock, A.H., C.A.65, 17128h
A review of cryogenic properties of polymers

Le Guellec, G., C. A. 57, 13942g (1962)
Processing and application of fluoro elastomers

Longiana, Carlo; Miglierina, Angelo: C.A. 68, 79270y, Ind. Gomma 12(1), 37-8 (1968) (Ital.), Review, characterization and uses of new fluorinated elastomers.

Manno, P.J., C.A. 63, 1878g and h
Radiation induced polymers of fluorine-containing monomers

McBee, E.T., C.A. 65, 13461b
History of the organic fluorine industry

McLoughlin, V.C.R.; Thrower, J., (London, Min. of Aviation, Mar. 1964, 19 p. refs.), Fluoroaromatic polymers, a review.

Miesowick, H., C.A. 64, 5249d
Freon and fluorine plastics

Miesowicz, Halina, C.A. 65, 17130d
A review of Freons and fluorinated polymers

Minoura, Yuji, and Saito, Kozo, C.A. 55, 9934f (1961)
Fluorine-containing polymers

Minoura, Y., C.A. 65 5631a
A review of relationship between elasticity and backbone structure of rubber

Montermoso, J.C., Rubber Chem. Technol. 34, 1521-52 (1961. C.A. 57, 1010g
Fluorine containing elastomers

Mouly, Michel, Rev. Gen. Caout. Plast. 44 (11), 1327-9 (1967)
C. A. 68 (8), 30805n
A review of fluorinated resins and elastomers, discussing preparation, processing, properties and uses of PTFE, PolyCTFE, polyCFTE elastomers and CTFE telomers.

Postelnek, W., Coleman., L.E., and Lovelace, A.M., Fortschr. Hochpolymer Forsch. 2, 75-113 (1959). C.A. 54, 10385b (1960)
Fluorine-containing polymers. I. Fluorinated vinyl polymers with functional groups, condensation polymers, and styrene polymers

Ritchie, Patrick D. (ed). Vinyl and Allied Polymers, Vol. 1: Aliphatic Polyolefins and Polydienes: Fluoro-olefins Polymers. (Iliffe: London) 1968 280 pp 65s. C.A. 70 (2), 4787e

Saltman, W. M., C.A. 65, 10771d
A discussion of polymerization, processing and properties of fluorinated elastomers

Satogawa, T. Kagaku Kogyo 19(8), 795 (1968) C.A. 69 (24), 97182w.
Preparation and properties of highly fluorinated polymers, a review.

Seymour, R. B., I and EC 55 (9), 56 (1963)
Polyfluorocarbons (among others)

Sherratt, S., C.A. 65, 12285c
Polytetrafluoroethylene. A review

Shkolina, M.A., C.A. 65, 13829a
A review of fluorine-containing polymers

Sieron, J.K.; Spain, R. G. (Schwartz, R.T.; Rosato, P.V. eds)
Environmental Effects on Polymeric Materials Vol II. Materials
John Wiley, New York 1968.

Sittig, Marshall, C.A. 65, 18716f
Fluorinated hydrocarbons and polymers

Sperati, C.A., and Starkweather, H.W., C.A. 55, 19316f (1961)
$(CF_2CF_2)_n$

Szurrat, J., C.A. 52, 16777d (1958)
Fluoro elastomers as construction material

Tatlow, J.C., Rubber and Plastics Age 39, 33 (1958)
Organic Fluorine rubbers

Vaillant, M., Chem. and Ind. (Paris) 80, 429-36 (1958). C. A. 53,
9030a (1959)
Chlorofluorinated polymers and their derivatives. I. Generalities
and properties.

Wolinski, L. E., C.A. 65, 12285h
Polyvinylfluoride. A review

Wood, G., (Royal Aircraft Establishment, Farnborough, England),
Limitations of materials. Part 6. Elastomers, (RAE-TN-CPM-52).
Report reviews properties of acrylics, fluoroacrylates, fluoro-
carbons, fluorosilicones and others.

II. Fluorine-Containing Vinyl Polymers

A. Vinyl Fluoride

Dietrich, J. J. et al., C.A. 66, 11907q
Appl. and properties of PVF

du Pont, Brit. 940, 176, October 23, 1963. C.A. 60, 6953g (1964)
Vinyl fluoride polymers

du Pont Neth. Appl. 6,511,117, C.A. 65, 3994g
Polymerization of vinyl fluoride

James, V. E., Belg. 614,581. C.A. 58, 9253f (1963)
Polyvinyl fluoride, using azo catalyst in water

Kalb, G. H., et al., J. Appl. Polymer Sci. 4, 55 (1960)
Vinyl fluoride, brittleness temp. for 200 gauge film is between -196 and -130°C

Kali-Chemie A.-G., Brit. 1,057,088 (Cl. C. 08f), February 1, 1967, C. A. 66, 66041b.
Vinyl fluoride and vinylidene fluoride polymers and copolymers.

Koenig, J. L., Mannion, J. J., C.A. 65, 3984f
Infrared study of poly vinyl fluoride

Kresta, J., et al., C.A. 65, 5552b
Preparation and properties of polyvinyl fluoride

Lundberg, Robert D.; Bailey, Frederick E., Jr. (to Union Carbide Corp.), U.S. 3,294,767 (Cl. 260-80.5), C. A. 66, 38500p.
Preparation of thermally stable vinyl fluoride polymers.

"Montecatini" Societa Generale per l'Industria Mineraria e Chemica, C.A. 67, 54590u, Fr. 1,464,332.
Polymerization and copolymerization of vinyl fluoride.

"Montecatini" Societa Generale per l'Industria Mineraria e Chemica, Ital. 704,906 (Cl. C. 08), April 27, 1966, Appl. September 16, 1965, 25 pp., C.A. 68, 22370.
Vinyl fluoride is polymd. or copolymd. with tetrafluoroethylene, vinylidene fluoride, or vinyl chloride in the presence of org. B. compounds.

Proctor, J. S., (to duPont), U. S. 3,096,299. C.A. 59, 8949f (1963)
Poly(vinyl fluoride) film soluble in DMSO

Sylvia, L. G., Jr., Ger. 1,218,716 (to du Pont) C.A. 65, 18862d
Laminated coating of poly-vinyl fluoride) using 18% TiO_2 as catalyst.

Usmanov, Kh.U., et al., C. A. 59, 11666a (1963)
Radiation polymerization of CH_2CHF

Usmanov, Kh.U., et al., C. A. 59, 11666b (1963)
Radiation polymerization of vinyl fluoride

Usmanov, Kh.U., et al., Proc. Tihany Symp. Radiat. Chem., 2nd, Tihany, Hung. 1966, 511-17 C.A. 68 (8), 30135u
Radiation polymerization and copolymerization of vinyl fluoride - studies effect of impurities and dose-rate on polymer m.w. and yield.

Usmanov, Kh. U.; Yul'chibaev, A.A.; Dordzhin, G.S.; Sirlibaev,T. Plast. Massy 1968, (8), 8-9 C.A. 69 (22), 87530u.
The kinetics of the γ-initiated polymerization of vinyl fluoride were studied.

Weintraub, L., et. al., Chem. Ind. (London) 1965
Copolymers of vinyl chloride with vinyl fluoride and CO

B. Vinylidene Fluoride

Coulter, D.J.B., C.A. 59, 14179f (1963)
Viton - a fluoroelastomer: properties and applications

Dixon, S., Rexford, D.R., and Rugg, J.S., Ind. Eng. Che. 49, 1687-90 C.A. 52, 4237f (1958)
Synthesis of viton

du Pont, Neth. Appl. 6,516,123, C.A. 65, 20366e
Anti-corrosive coating material for ferrometals.
Poly(vinylidene fluoride) + Zn + γ-butyrolactone + MeCOEt + PhMe

Enomoto, S.; Kawai, Y.; Sugita, M. J. Polymer Sci. Part A-2 6 (5), 861 (1968) C.A. 69 (2), 3292 g
Infrared spectrum of poly(vinylidene fluoride), α and β crystalline forms.

Gabris, T., C.A. 53, 751d(1959)
Viton A, a fluorine-containing elastomer

Hauptschein, M., (to Pennsalt Chemicals Corp.), U. S. 3,012,021. C.A. 57, 2428f (1962)
Poly(vinylidene fluoride)

Sianesi, D., et. al. Belg. 626,289; C.A. 60, 18005c (1964).
CH_2CF_2/CF_2CHCF_3, elastomers with 10 to 70% propene.

Shashkov, A.S., et al., C.A. 64, 16007h
NMR study of $CH_2=CF_2$ and $CF_2=CFH$ copolymers

Stivers, D.A., Honn, F.J., and Robb, L.E., IEC, 51, 1465 (1959).
C.A. 54, 8139f (1960)
Properties of $CF_2=CH_2/C_3F_6$

Volkova, Ye. V., et al., Zhur. vsesoy. khim. obshch. im. D.I. Mendeleeva, 7, 593(1962)
CH_2CF_2 polymerization by gamma radiation

White, H.F., C.A. 62, 9251c
Poly(vinylidene fluoride) chains ($-CH_2CF_2CH_2CF_2-$) and ($-CH_2CF_2CF_2CH_2-$)

Wilson, A., Griffis, C.B., and Montermoso, J.C., C.A. 54, 12632c (1960)
Evaluation of copolymer of $CH_2=CF_2$ and $CF_3-CF=CF_2$ showed good resistance to heat, acid, fuels, and oil but poor resistance to cold.

C. Tetrafluoroethylene

Arvia, A. J., Aymonino, P.J., and Schumacher, H. J., C.A. 55, 21759H (1961)
Kinetics of the polymerization of gaseous C_2F_4 with $(CFO)_2O_2$

Bates, T.W., Stockmayer, W.H., C.A. 66, 11257c
Conformational properties of isolated poly(tetrafluoroethylene) chains

Bates, T.W. and Stockmayer, W.H., Macromolecules 1 (1), 17(1968)
C.A. 68, 115130p
Conformational energies of perfluoroalkanes III. Properties of poly(tetrafluoroethylene).

Bolstad, A.N., U.S. 3,163,628 (to 3M); C.A. 62, 6587h (1964)
Copolymer of $CHFCCL_2/C_2F_4$ claimed to be elastomeric

Bro, M.I., (to du Pont), U.S. 2,943,080. C.A. 54, 20339c (1960)
Copolymers of tetrafluoroethylene and fluorinated olefins

Brown, Daniel W.; Wall, Leo A. J.Polymer Sci. Part A-1 6 (5), 1367 (1968) C.A. 69 (2), 3161 p.
Radiation-induced co-polymerization of tetrafluoroethylene and 3,3,3-trifluoropropene under pressure.

Brit. 1,004,449 to du Pont. C.A. 64, 11398a
C_2F_4 copolymer with $CF_2=CFSO_2F$

Bruk, M.A., et al., C.A. 59, 4039 (1963)
Radiation polymerization of CF_2CF_2 in the solid state

D'Agostino, V.F., and Lee, J., AD 800637
Tetrafluoroethylene-ethylene copolymers.

Daikin Kogyo Co., Ltd., Japan 21,438(1965). C.A. 64, 3725g
Emulsion polymerization of C_2F_4

Daikin Kogyo Co., Ltd., Fr. 1,446,739 (Cl. C. 08f),
July 22, 1966, C. A. 66, 38338s.
The preparation of tetrafluoroethylene-ω-hydroperfluoro-olefin copolymers.

Dube, G., and Kriegsmann, H., C.A. 62, 9249e
IR spectrum and the transformation points of poly TFE

Dube, G., Kriegsmann, H., C.A. 64, 14302d
Infrared spectra investigation of poly TFE

duPont Brit. 1,030,567, C.A. 65, 5618a
Poly(tetrafluoroethylene) molding powder

duPont,Neth. Appl. 6,514,077, C.A. 65, 12355c
TFE copolymers

du Pont (by Wallace R. Brasen and Charles S. Cleaver) 1,469,510
(Cl. C08f) C.A. 68 (4), 13885w
Elastomers containing tetrafluoroethylene and propylene (optionally 2-chloroethyl vinyl ether).

Durrell, W.S., Stump, E. C. and Schuman, P.D., C.A. 63, 16535b
T_g of poly(tetrafluoroethylene) -50°C

Elsuf'ev. S.A. Mekh. Polym. 4(4), 742(1968); C.A. 70, 4857c
Deformation of poly(tetrafluoroethylene) in linear and planar strained states.

Gozzo, F., Maggi, G., C.A. 65, 5350f
Oxidation reactions of C_2F_4 and their products

Graham, D.P., J.O.C. 31, 955(1966)
Anionic polymerization of TFE. CsF/diglyme

Halliwell, R. H., to du Pont), U.S. 3,110,704. C.A. 60,
6950h (1964)
Low pressure TFE polymerization

Hazeldine, R., Banks, R.E. and McCreath, M.K., Neth. 287,467.
C.A. 63, 3072c
$(CF_3)_2CClNO + C_2F_4$

Hirose, K., et al., C. A. 62, 11934e
Copolymer of C_2F_4 and C_2H_4

Iwaski, M.; Toriyama K.; Sawaki, I.; Inone, M.; C.A. 67,
69323h, J. Chem. Phy. 47(2), 554-9 (1967) (Eng.).
Electron spin resonance of γ-irradiated tetrafluoroethylene-
hexafluoropropylene copolymers.

Ishiguro, K., et al., C.A. 63, 7113a
Copolymers C_2F_4 and isobutylene Co^{60} initiated

Jeffrey, G. C. (to Dow), U. S. 3,235,611
C.A. 64, 17421h
TFE and $CCl_2=CCl_2$ telomers

Johnson, G. R., Na. Acad. Sci. Nat. Res. Counc. Publ. No. 1484
78 (1967) C.A. 68 (20), 87720f (1968)
Dielectric properties of poly(TFE).

Kawasumi, Kazuhisa; et al Japan 68 03. 980 (C1.25H91)
C. A. 69, 20224 d
Silicone rubber containing poly(tetrafluoroethylene)

Kenichi Tominaga and Kunio Mizushima (to Thiokol Chem. Corp)
U.S. 3,331,825 (7/18/67) C.A. 68, 40478x
Poly(tetrafluoroethylene) molding powders of improved
resistance to coalescence.

Krespan, C. G., (to du Pont), U. S. 2,938,889. C.A. 54, 20327g
(1960)
Use of PbF_4, AgF_2, CoF_3 in AsF_3 to polymerize CF_2CF_2 and
copolymerize with $F(CF_2)_nCF=CF_2$.

Lee, Joseph; Yen, Jesse; D'Agostino, Vincent F. (Radiation Applications
Inc.) Final Report Contract DA-49-186-AMC-261(D) Report
RAI-386 A D 825 150 U.S.Govt. R & D Rcp'ts 68 (22), 11 (1968)
Copolymers of tetrafluoroethylene for superior dielectric
materials.

Makarevich, N.I., C.A. 65, 18755f
Structure of tetrafluoroethylene and vinylidene fluoride
copolymer by spectroscopic methods

Marsh, D. G., and Heicklen, J., J.Am.Chem.Soc. 88, 269(1966)
The chlorine atom initiated polymerization of C_2F_4.

Mathias, Eckart; Miller, Glen H.: C.A. 67, 64841r,
J. Phys. Chem. 71(8), 2671-5 (1967) (Eng.).
The decomposition of poly(tetrafluoroethylene) in a glow discharge.

Milek, J., C.A. 63, 737h
Survey of poly TFE properties

Montecatini, Belg. 624,205; C.A. 60, 13344c (1964)
C_2F_4/CF_3CHCH_2

Montecatini, Neth. Appl. 6,509,095, C.A. 65, 903b
$S_2O_8^=$ polymerization of TFE, $CF_3CF=CFH$, $CH_2=CF_2$

Munari, S., et al., C.A. 65, 12350a
Synthesis and some properties of cationic membranes grafted onto a poly TFE backbone

Nitto Chemical Ind. Co., Ltd., Japan, 19,188('65),
C. A. 65, 12389g
Rubber-like copolymers of TFE and α-olefins

Nosov, E. F., et al., C.A. 65, 18693H
Tetrafluoroethylene polymerizations in aqueous solutions

Pattison, D.B., Fr. 1,365,581 (to du Pont). C.A. 62, 7983d
$TFE/CH_3OCH=CH_2$ copolymer elastomers

Perepelkin, K.E., C. A. 65, 4014f
Elastic modulus and load-elongation results on poly TFE

Research Foundation for Dev. of Ind., Japan
18,430('65), C.A. 65, 10690c
TFE polym'd. by α-, β-, γ-, or X-rays

Roberts, H.L., (to ICI), U.S. 3,063,922, November 13, 1962
Polymerizing C_2F_4 with SF_5Cl and u.v. irradiation

S. Sherratt, Brit. 929,990 (to Imperial Chemical Industries, Ltd.),
C.A. 59, P6536g (1963).
Copol. of $SF_5CF=CF_2/C_2F_4$ t_c, 331°

Sianesi, D., Bernardi, G., et al., C.A. 63, 4477h
Copolymer C_2F_4 with $CF_3CF=CHF$

Sobue, H., Tabata, Y, and Shibano, H., C.A. 59, 15404b (1963)
Copolymer of tetrafluoroethylene and ethylene

Sobue, H.,Tabata, Y, and Shibano, H., C.A. 60, 686c (1964)
$(CF_2CF_2)_n$ by gamma radiation

Tabata, Y., et al., C.A. 58, 6931f (1963
Gamma-induced polymerization of C_2F_4 and C_3H_6 at low temperature.

Tabata, Y., et al., J. Polymer Sci. 2(4), 1977-86 (1964); C.A. 62, 728b (1964) also C.A. 61 7105b (1964)
Copol. C_2F_4/C_2H_4 induced by ionizing radiation

D. Dienes

Anderson, J.L., Berry, K.L., (to duPont) U.S. 3,218,303. C.A. 64, 2718c
Fluorobutadienes and their polymers.

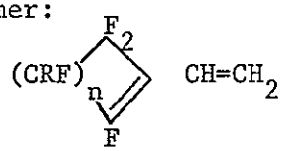
Barr, John T. (to Pennsalt Chem. Co.) U.S. 3,379,773. (Cl. 260-615) C.A. 68, 115540X
Copolymers of 1,1,2-trifluorobutadiene

Bolstad, A.N., and Lo. E.S., (to 3 M) U.S. 2,951,063.
C.A. 55, P 1047d (1961)
Copolymers of $CF_2CHCFCH_2$ with $CH_2CFCHCH_2$

Bolstad, Archibald, N.; Hoyt, John M. (to 3 M Co.) U.S. 3,398,138 (Cl. 260-87) C.A. 69 (18), 68146g
Copolymers of fluorine-containing dienes comprising 1,1,2-trifluorobutadiene-1,3 and some other fluorine-containing diene.

Brown, D., et al., C.A. 62, 16391_f
Polymerization of perfluoropentadiene at high pressure with γ-ray.

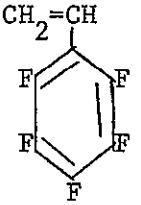
Butler, A.J., et al. (to Dow-Corning) French Pat. 1,423,548, C.A. 65, 17084h
Fluorinated monomers and polymers
Monomer:



R = H, F
n = 2 or 3

Cook, Edward W. (FMC Corp) U.S. 3,391,118 (Cl 260-61)
C.A. 69 (10), 36886g
The reaction of perfluoro-dienes with KOH Salts of highly fluorinated diols gives poly-ethers. The polymer of 4-chloro-perfluoro-1,6-heptadione with hexafluoropentanediol gives an elastomer having T_g -50°C.

Dow Corning Corp. Brit. 1,026,637, C.A. 65, 824b
$CH_2=CHCH=CFCF_3$ copolymerized with $CH_2=CH$
S_2O_8 initiator



Druesedow, D., (to B. F. Goodrich), Ger. 1,031,968. C.A. 54, 13744d (1960)
Copolymers of 1,3-butadiene and 1,1-difluoro-2,2-dichloroethylene. Increase of $CF_2=CCl_2$ diminishes flexibility.

E. I. duPont de Nemours & Co.: C.A. 68, 40493y, Brit. 1,073,817 (Cl. C. 08f) June 28, 1967.
Poly(perfluorocyclopentadienes) and their production. A perfluorocyclopentadiene-hexafluoropropylene-vinylidene fluoride terpolymer.

Fearn, J.E. and Leo Wall, U.S. Gov. Research Reports AD 435087.
Preparation and polymerization of some perfluorodienes.

Fearn, J.E., and Wall, L.A., SPE Trans. 3,(3), 231-4(1963)
Polymers of $CF_2CFCF_2CFClCF_2CF=CF_2$

Fearn, J.E., Wall, L.A., C. A. 64, 8321b
Polymers of perfluorohexadiene, perfluoroheptadiene, and perfluorooctadiene

Fearn, J.E., et al., C.A. 64, 12812c
Polymerization of perfluoro-1,4-pentadienes

E. Frisch and O. Steward, Fr. 1,361,256, (to Dow Corning Corp.); C.A. 61, 13445b
u.v. initiated polymerization of $CF_3CF=CFCH=CH_2$ gave a tough flexible polymer with a softening point of 170°.

Honn, F.J., (3M), Ger. 1,089, 973. C.A. 55, 16000b (1961)
Polyfluoro-substituted butadienes

Honn, F.J., (to 3M), U.S. 2,949,446. C.A. 55, P 1048f (1961)
Copolymers of styrene with fluorinated dienes

Hoyt, J.M., (to 3M), U.S. 2,843,575. C.A. 53, 26756 (1959)
Copolymer of fluoroprene and perhalogenated ethylene

Iserson, I.I., Hauptschein, M., Lawlor, F.E., J.Am. Chem. Soc. 81, 2676 (1959). C.A. 54, 7528d (1960)
$CF_2=CFCF=CH_2$

Jones, F.B., and Coleman, L.E., J.Polymer Sci. 28, 242 (1957). C.A. 55, 6025f (1961)
Copolymerization of $CF_2CHCF_2CHCF_2$, $CF_2=CFCF_2CFClCF_2Cl$

$CF_2=CFCF_2CF-CF_2$, $EtOC=CFCF_2CF_2$

Klebanskii, A.L., and Timofeev, O.A., C. A. 54, 8587a (1960)
Polymerization of hexafluorobutadiene. Effect of several factors on polymerization with chloroprene

Klebanskii, A.L., and Timofeev, O.A., C. A. 54, 22317a (1960)
Copolymerization of hexafluorobutadiene with diene compounds in solution.

Klebanskii, A. L., and Timofeev, O.A., J. Polymer Sci. 52, 23-9 (1961) C. A. 56, 6162b (1962)
Relative activity of hexafluoro-1,3-butadiene in polymerization and copolymerization reactions with other dienes

Klebanskii, A. L., and Timofeev, O.A., C. A. 54, 8131e (1960)
Polymerization of hexafluorobutadiene

Klebanskii, A. L., and Timofeev, O.A., C. A. 54, 22317a (1960)
Copolymerization of hexafluorobutadiene with diene compounds in solution.

I. L. Knunyants et al., C. A. 60, 11883g
Preparation and polymerization of some perfluorodienes. Dienes as $CH_2=CH(CF_2)_nCH=CH_2$ polymerize readily.

Kolesnikow, G. S., et al., C. A. 55, 21655f (1961)
$CCl_2CClCHCH_2$ polymers and copolymers

Krbekyan, G. E., Sinanyam, E. G., and Akopyan, A.N., C. A. 59, 12927e (1963)
Copolymerization of trans-2,3,4,5-tetrachlorohexa-1,3;5-triene

Lo, E. S., (to 3 M), U.S. 2,837,503. C.A. 53, 1805b (1959)
1,1,1-Trifluoro-3-trifluoromethyl-2-butene elastomers copolymerized with 1,1,2-trifluorobutadiene and 1,1,3-trifluorobutadiene. Flexible at -28°C.

Lo, E.S., (to 3M), U.S. 2,938,888. C. A. 54, 20276d (1960)
Chloroprene copolymers with $CF_2CFCHCH_2$ + $CF_2CHCFCH_2$

Lo, E.S., (to 3 M), U.S. 2,951,064. C.A. 55, P 1047f (1961)
Copolymerization of CH_2CClCF_3 with $CH_2CFCHCH_2$

Lo, E.S., and Crawford, G.H., (to 3M), U.S. 2,951,065. C.A. 55, P 1047h (1961)
Elastomeric 2-(trifluoromethyl)butadiene copolymers

Lo,E.S., (3M), U.S. 2,979,489. C. A. 55, 19276b (1961)
Copolymers of 2-trifluoromethyl butadiene

3M, WADC TR 52-197. Pts 1-6. 1952 - 1956.
Polymers from $CH_2CFCHCH_2$, $CF_2CFCHCF_2$, $CF_2CFCFCF_2$, $CF_2CClCFCF_2$, $CH_2C(C_3F_7)CHCH_2$

3M, U.S. Army Contract No. DA-19-129-QM-1043. Report for the period October 15, 1957-August 15, 1960
Polymers from $CF_2CHCFCH_2$ and $CF_2CFCHCH_2$

Norton, Ted R. (to Dow Chemical Co.) U. S. 3,362,935 (Cl. 260-63) C.A. 68, 40540 m
1-(p-vinylphenyl)-4,4,4-trifluoro-1,3-butanedione polymers.

Pennsalt, WADC TR 57-436. ASTIA Doc. No. AD 142116, November, 1957.
Polymerization studies with $CF_2CFCFCF_2$, $CF_2CFCClCH_2$,

$CF_2CFCFCH_2$, $CF_2CFCClCHCl$, $CF_2{=}CFC{=}CFCF_2CF_2$

last three polymerize with difficulty

Soboleva, T.A., Suprum, A.P., and Kolesnikov, H.S., C.A. 59, 5269g (1963)
Polymerization of $CCl_2{=}CClCH{-}CH_2$

Toy, Madeline S.; Lawson, D.David. J.Polym.Sci., Part B. 6(9), 639(1968) C.A. 69(22), 87540x
Polymerization of perfluorobutadiene by nitroxide and peroxide; structure studies on polymer

Wakefield, L.B., IEC 43, 2363 (1951)
$CH_2CFCFCH_2$, Synthesis, polymerization, T_g = 1°C

E. Vinyl Ethers and Thioethers

Abramo, J.G., and Reinhard, R.H., (Monsanto), U.S. 2,975,161. C.A. 55, 17101i (1961)
Copolymers of allyl fluoroalkyl ethers

Air Reduction Company, Brit. 811,037. C.A. 53, 10849g(1959)
Copolymer of $CF_3CH_2OCHCH_2$ and vinyl esters

Barr, J.R., (to Pennsalt Chem. Co.), U.S. 2,813,848. C.A. 52, 3406e (1958)
Copolymers of $CF_2CH_2OCHCH_2$ and CF_2CHCl

Barr, J.T., U.S. 3,025,279. C.A. 57, 1013a (1962)
Copolymers of trifluoroethylvinyl ether and fluoro alkyl acrylates

Bovey, F.A., Smith, S., and Abere, J.F., (to 3 M), Ger. 1,040,248. C.A. 54, 25939a (1960)
Rubbery copolymers of $CF_2CFCFCF_2$ and 1,1-dihydroperfluoroalkyl vinyl ethers.

Brown, D.W., and Wall, L.A., SPE Trans, 3(4), 300(1963). C.A. 60 (1964)
Low polymers $\phi CFCF_2$ and $\phi_f OCFCF_2$ by a irradiation

Crawford, G. H., and Lo, E. S., (3M), U. S. 2,975,164. C.A. 55, 15999f(1961)
Polymers of $CH_2=CHOCF_2CF_2H$

Darby, R.A., Fr. 1,341,087 (to E.I. du Pont de Nemours and Co.); C.A. 60, 9151a (1964)
Copolymer of C_2F_4 with $CF_3CF_2CF_2OCF(CF_3)CF_2OCF=CF_2$ using N_2F_4 as initiator gave a high MW polymer

Dixon, S., U.S. 2,917,548 (1959). C.A. 54, p 547e (1960)
$RONa + CF_2CF_2 \longrightarrow ROCFCF_2$

du Pont, Brit. 926,573 (1963). C.A. 60, 1596b (1964)
Polymers of vinylperfluoroalkyl sulfides

du Pont, Brit. 953,089
Terpolymers of fluorocarbon vinyl ethers and other fluorine-containing monomers

du Pont de Nemours and Co., Brit. 953,089. C.A. 61, 16275a
Terepolymers of $CF_3OCF=CF_2/C_2F_4/CF_2CH_2$ using

Durell, W. S., et al., J. Pol. Sci . Pt. A 3, 4065(1965)
Polymers of fluorocarbon ethers and sulfides

E. I. duPont de Nemours & Co., filed August 1, 1966, U. S. Ser. No. 569,112.
Crosslinkable polymers formed from iodine-containing perfluoroalkyl vinyl ethers.

Folt, V. L., (to B. F. Goodrich), Ger. 1.003,447. C. A. 53, 23016e(1959)
Copolymers of CF_2CCl_2 and vinyl alkyl ethers

Fritz, C. G., Moore, E. P. Jr., and Selman, S., (to Du Pont), U. S. 3.114,778 C.A. 60, 67506(1964)
Synthesis of perfluoroalkyl trifluorovinyl ethers, including $CF_3OCF=CF_2$

Gorden, J., and Woolf, C., (to Allied Chem. Co.) U. S. 2,870,222. C.A. 53, 8709h(1959)
Low polymers from $BF_3 + CF_2CHOCH_3$

Harris, J. F. Jr., and McCane, E. I., (to Du Pont), Brit. 812,116, April 15, 1959. C.A. 53, 14585f(1959)
Polymers from CF_2CFOR

Harris, J. F. Jr., (to du Pont), U. S. 3,048,569. C.A. 57, 16886i(1962)
Vinyl perfluoroalkylsulfides and their polymers

Holly, E. D., and Nummy, W.R., (to Dow Chem), U. S. 2947,730. C.A. 54, 26010h(1960)
Polymer of vinylpentachlorophenylsulfide

Kealy, Thomas J. (E. I duPont de Nemours & Co.),
U.S. 3,299,019 (Cl. 260-8.5), C.A. 66, 66484e.
Preparation of curable partially dehydrofluorinated trifluoromethyl vinyl ether-tetrafluoroethylene copolymers.

Khomutov. A.M., C.A. 59, 11670g (1963)
Reactivity of vinyl ethers in copolymerization

Lo, E. S. (3M), U.S. 2,975,163. C.A. 55, 16004i(1961)
Copolymers of $CF_2=CFCF_2OCH_2R_f$

Maksimov, V.L., et. atl, C.A. 65, 3984g
Macromolecular structure of vinylidene fluoride and perfluoromethyl vinyl ether copolymer by NMR

D. McCane, U.S. 3,132,123 (to E.I. du Pont de Nemours and Co.),
C.A. 61, 1968h also Brit. 953,152 and U.S. 3,159,609.
Copolymers of $CF_3OCF=CF_2$. 11.3 wt% C_2F_4, tough film; 27% CH_2CF_2 rubber.

3M Company, WADC Tr 52-197. PTS 1-6. 1952-1956
Polymers of CH_2CHOR, where R=CH_2CF_3, CF_2CF_2H, CF_2CFHCF_3, $CH_2C_3F_7$, and $CH_2C_5F_{11}$

3M Company, U. S. Army Contract No. DA-19-129-QM-1043. Report for the period October 16, 1957 to August 16, 1960.
Polymers of $CF_3CH_2OCH=CH_2$

Okuhara, K., Baba, H., and Kojima, R., C.A. 57, 5784c (1962)
Preparation and properties of alkyl trifluorovinyl ethers and related compounds.

Pennsalt Chem. Co., WADC TR 57-436. ASTIA Doc. No. AD 142116, Novermber 1957
Polymers of $CF_3CH_2OCHCH_2$

Perry, R.W., (to Firestone Tire and Rubber Co.), U.S. 2,799,025.
C.A. 51, 7054a(1957)
Copolymer of monochlorotrifluoroethylene and an alkyl vinyl ether.

Pittman, Allen G; Ludwig, Barbara A.; Sharp, Dennis L.:
J.Polymer Sci. Part A-1 6, 1741(1968) C.A. 69 (2), 3268d.
Polymers derived from fluoroketones: III Monomer synthesis, polymerization, and wetting properties of poly (fluoroalkyl allyl ethers) and (fluoroalkyl vinyl ethers)

Pummer W. and Wall, L. C.A. 61, 2999d
Preparation and polymerization of $C_6H_5CFCF_2$ and $C_6F_5CFCF_2$. Polymerization required high pressure (10,000 atm), gamma initiation.

Pummer, W.J., and Wall, SPE Trans. 3(3), 220 (1963)
CF_2CFO and $CF_2CFOC_6F_5$

Ray, N. H., Brit. 931,919. C.A. 59, 10258b(1963)
Polymers of $SF_5CH=CH_2$

Robertson, James J., (to Firestone Tire and Rubber Co.), U.S. 2,905,660 C.A. 54, 2823b(1960)
Copolymers of CF_2CFCl with vinyl alkyl ethers

Schildknecht, C.E., (to Air Reduction), U.S. 2,820,025. C.A. 52, 5872c (1958)
$(CF_3CH_2OCHCH_2)_n$

Schildknecht, C.E., (to Air Reduction Co.(, Brit. 810,515, C.A. 53 23044h(1959)
Copolymers of $CF_3CH_2OCHCH_2$ and chloroolefins

Schildknecht, C.E., (to Air Reduction Co.), U.S. 2,851,499. C.A. 53 2694h(1959)
Copolymers of $CF_3CH_2OCHCH_2$ and vinyl esters

Schildknecht, C.E., (to Air Reduction Co.), U.S. 2,991,278. C.A. 55. P 27988g(1961)
Copolymers of $CF_3CH_2OCH=CH_2$ with haloolefins

Schuman, P.D.; Stump, E.C., Westmoreland, G.
Development of vulcanizable elastomers suitable for use in Contact with liquid oxygen. In "Proceedings of the NASA-case conference on the properties of polymers at cryogenic temperatures, Cleveland, Ohio, April 25027, 1967. pp263-278.' Marcel Dekker, 1968 NASA ref Co6 A69-16497
Synthesis, polymerization, and evaluation of perfluoropoly-(vinyl ethers) as elastomers for use in contact with liquid oxygen.

Sorkin, H., et. at., C.A. 64, 5274
Dielectric properties of some poly(fluoroalkyl vinyl ethers)

Sorkin Howard (to Air Reduction Co.) U.S. 3,394,116(Cl 260-91.1) CA 69, 58825P
Preparation and polymerization of trifluoroethoxyethyl vinyl ether.

Vandenberg. E. J., Heck, R. F., and Breslow, D.S., J. Polymer Sci., 28, 249(1958). C.A. 54, 11552b(1960)
Crystalline polymers of $CF_3CH_2OCHCH_2$ from Ziegler catalysts

Wall, L.A.; Pummer, W.J. (to U. S. Navy) U.S. 3,277,068, C.A. 66, 18591r

Perfluorovinyl phenyl ethers and their polymers

$$C_2F_4 + \begin{matrix}\text{PhONa}\\ \text{or}\\ \text{PhOK}\end{matrix} \longrightarrow PhOCF{=}CF_2$$

Polymerization of I with Co^{60}

Wall, Leo A.; Pummer, Walter J,: C.A. 68, 87760y, U.S. 3,371.064 (Cl. 260-47), February 27, 1968.

Fluorophenyl vinyl ethers and their polymers

F. Misc. Polymers

Adams, G.C. and R.S.Stein, J.Polymer Sci., Part A-2 6 (1), 31 (1968)CA 68 (20), 87681y (1968)
The crystallization of polyCTFE films: rates and nucleation mechanisms for isothermally crystallized 96% CTFE - 4% VF_2

Aldrich, P.E. (to duPont), U.S. 3,162,622. C.A. 62, 7968h

$$\left\{ \begin{array}{l} CH=CH_2 \\ | \\ OCF_3 \end{array} \right\}_x$$

Allied Chem. Co., Neth. Appl. 6,503.339. C.A. 64, 6783
Perfluorocyclobutene polymers

Allied Chem. Corp. Neth. Appl. 6,412,462, C.A. 64, 8377f

$CH_2=CHCOCH(CFX_2)_2$ X-F, Cl polymerized with Bz_2O_2

Allied Chem. Corp. Belg. 661.154, C.A. 65, 3992g
Perfluorocyclobutene polymers

Anello, L.G.; Sweeney, R.F. (to Allied Chemical Co.) U.S. 3,384,627 (Cl. 260-89.5) C.A. 69, 19787h
Polyfluoroalkyl acrylate monomers, polymers, and intermediates

Anspon, H.D., (to GAF) U.S. 2,956,939. C.A. 55 P 6923a (1961)
Methyl α-fluoroacrylate

Bissell, Eugene R. (Calif. Univ., Liver, Lawrence Radiation Lab) Report UCRL - 50464. Contract W-7505-eng-48 USGRDR 69 (6), 66 (1969)
Preparation and properties of 2,2-difluoro-2-nitroethyl acrylate polymers.

Bolstad, A.N.,(to 3 M), U.S. 2,842,529. C.A. 52, 16790c (1958)
3,3,3-Trifluoropropene polymers

Bolstad, A.N., and Honn, F.J., (to 3M), U.S. 2,966,482. C.A. 55, 8916e (1961)

$CF_3C=CCF_3$: CH_2CFCl copolymers

Borland, J.W., Miller, C.G. and Pearson, J.H., (to Allied Chem. Co.) U.S. 2,865,824. C.A. 53, 5749c (1959)
Produces polymers for resistance to corrosive substances.
CF_2CFCl, CH_2CFCl, CH_2CF_2, CF_2CFH, CF_2CHCl

Brehm, W.J., and Millıan, A.S., (to du Pont), U.S. 3,053,823. C.A. 57, 16890d (1962)
Copolymers of hexafluoropropylene and fluoranil, basically $(C_3F_6)_n$

Bro, M.I., Convery, R.J., and Schreyer, R.C., U.S. 2,988,542. C.A. 55, 22917a (1961)
Fluorine-contaıning 1-olefins polymerized in a halogenated solvent with $R_f\overset{O}{\overset{\|}{C}}OOH$

Brown, H.C., and Gewanter, H.L., J. Org. Chem. 25, 2071 (1960). C.A. 55, 14283i (1961)
Polymerization of $CF_3C{\equiv}CCF_3$

Calfee, J.D., Wildı, B.S., (to Monsanto) U.S. 3,252,954
Polymerization of CH_2-CFCl and subsequent dehydrochlorination

Ching-Hung Chem. C.A. 63, 2888d
Radical polymerızation of fluoroalkenes

Chow, Sui-Wu, and Pilato, L.A. (to UCC) Fr. 1,395.586. C.A. 63, 18295a
Poly(α,α,α',α'-tetrafluoro-p-xylylenes)

Coleman, L.E., Jr., and Burrell, W.S., J.Org. Chem. 23, 1211-13 (1958) C.A. 53, 2124a (1959)
Reactivity ratıos of trifluoromethyl substituted styrenes with methyl methacrylate and styrene

Coleman, L.E., Jr., Rausch, D.A., and Griffin, W.R., Chem. and Eng. Data Ser. 3, 113-15 (1958). C.A. 53, 12734d (1959)
Polymerization of some 1-alkyl-1-hydroperfluoroalkyl acrylates

Coleman, L.E., and Durrell, W. A., C.A. 55, 18173f (1961)
Synthesis and characteristıcs of new vinyl polymers. Substitution of CF_3 on styrene increased polymerization reactivity.

Colombo, P., Steinberg, M., and Chapman, R.N., J.Polymer Sci. Part B, Polymer Letters 1, 435 (1963)
Explosive decomposition of the mixture ethylene and CF_2CFCl

Colombo, D., Steinberg, M., and Macehia, D., J.Polymer Sci. Part B 1, (9), 483-8 (1963). C. A. 59, 14116d (1963)
Co^{60} gamma-ray induced copolymerization of ethylene in presence of other monomers

Crawford, G. H., U. S. 3,089,866. C. A. 59, 1776h (1963)
Ziegler polymerization of fluoroolefins

Daikin Kogyo Co. Ltd. Brit. 111007 (Cl. C 08f) C.A. 69 (2), 3312 p.
Fluorine containing polymers. Prep of $CF_2=CFCO_2H$, $CF_2=CFCF_2CO_2H$, $CF_2=CF(CF_2)_3CO_2H$ and copolymerization with C_2F_4, CTFE, C_3F_6-C_2F_4, CF_3NO-C_2F_4, C_2HF_3, $C_2Cl_2F_2$, etc.

Daikin Kogyo Co., Ltd., Japan. C.A. 64, 3722b
Perfluoro-olefin polymers

Daikin Kogyo Co., Ltd., Japan. C.A. 64, 9839a
Fluorohydrocarbon polymers

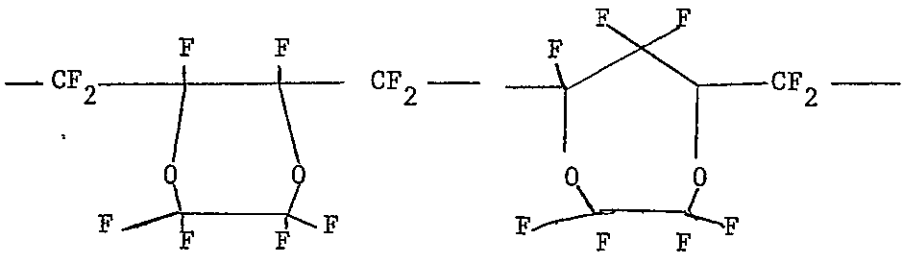
Dennstedt, I., and Becker, W., Ger. 959,060. C.A. 53, 13670e (1959)
Polymerization of CF_2CFCl

Dittman, A. L., Passino, H.J., and Wrightson, J.M., U.S. 2,689,241 C. A. 49, 11681a (1955)
Redox system for CF_2CFCl

Dittman, A. L., Passino, H. J. and Wrightson, J.M., (to 3 M) U. S. 2,837,505. C. A. 52, 15130b (1958)
Polymerization of $CHF=CF_2$ in H_2O

E. I. duPont de Nemours & Co., U.S. 3,342,777.
Addition copolymers of polyfluoroketones and ethylenic compounds.

duPont, French Patent 1,428.964. C.A. 65, 20243a
Polymers of perfluorinated cyclic ethers



E. I. duPont de Nemours & Co.: C. A. 67, 64887k, Brit. 1,068,984 (Cl. C. 08f), May 17, 1967.
Bis(pentafluoroalkyl) ketenes are copolymd. with ethylenically unsatd. monomers by using free radical initiators.

Druesedow, D., (to B.F.Goodrich), Ger. 1,031,968. C.A. 54, 13744d (1960)
Copolymers of 1,3-butadiene and 1,1-difluoro-2,2-dichloro-ethylene. Increase of $CF_2=CCl_2$ diminishes flexibility.

Duck, E.W., Brit. 853,355. C.A. 55, 10969f (1961)
Ziegler polymerization of perfluoroolefins.

Eleuterio, H.S., (to du Pont), U.S. 2,958,685. C.A. 55, P6041c (1961) C_3F_6 polymers

Eleuterio, H.S., and Moore, E.P., 2nd International Fluorine Symposium, Estes Park, Colorado, July 17-20, 1962
$(C_3F_6)_n$

Elliot, J.R., Myers, R.L., and Roedel, G.F., I and EC 45, 1786 (1953)
Polymer of CF_2CFCl

Fear, E.J.P., et al., C.A. 65, 7079d
Perfluoropolyphenylenes from pentafluorophenyl magnesium bromide

Florin, R.E., and Wall, L.A., J. Research NBS 65-A, 375 (1961)
Gamma irradiation of fluorine-containing polymers

$$CF_2CFH \xrightarrow[60\text{-}80°]{\text{persulfate}} +CF_2CFH+_n$$

Fokin, A.V., et al., U.S.S.R. 125,678. C.A. 54, 14791c (1960)
Gamma radiation in Cl containing solvent.

Geigy, J.R., A.-G., C.A. 68 79609r, Neth. Appl. 6,611,407 (Cl. C. 08f), February 14, 1967
Copolymers of 1,1-dihydroperfluoroalkyl α-trifluoro-methacrylates.

Gilinskoya, N.S.; Galil-Ogly, F.A.; Novikov, A.S. Kauch.Rezina 27 (4), 2 (1968) C.A. 69(4), 11231b
Properties of solutions of the fluorine-containing rubber SKF - 26, including osmometric and viscometric methods.

Goldschmidt, A., J.Am.Chem. Soc. 73, 2940 (1951)
Low polymers formed

Haas, H. C., Emerson, E.S., and Schuler, N.W., J. Polymer Sci., 22, 291-302 (1956). C.A. 51,3179d (1957)
Poly(vinyl trifluoroacetate) homopolymers and copolymers with vinylacetate

Hamilton, J.M., Jr., I and EC 45, 1347 (1953)
Polymer of CF_2CFCl

Hann, F.J., and Hoyt, J.M., U.S. 3,053,818. C.A. 58, 3584e (1963)
CF_2CFCl interpolymers

Harris, J. F. Jr., (to duPont), U.S. 3,037,010. C.A. 57, 7465e (1962)
Polymeric perfluoro-2-butyne

Haszeldine, R.N., Fields, R., U. S. 3,234.149 C.A. 64, 17803b
Poly[(perfluoroalkyl)methylene]

Hauptschein, M., et al. (to Pennsalt). U.S. 3,240,825
C.A. 58, 13815h
Homotelomers of $CF_3CF=CH_2$

Hoyt, J.M., (to 3M), U.S. 2,836,582. C.A. 52, 14223f (1958)
Redox system used

Hoyt, J.M., (to 3M), U.S. 2,843,575. (C.A.53, 26756 (1959)
Copolymer of fluoroprene and perhalogenated ethylene

Imperial Chem. Ind., Ltd., Neth. Appl. 6,505,550 C.A. 64, 14309c
Perfluorophenylene polymers

Iserson, I.I., Hauptschein, M., Lawlor, F.E., J. Am. Chem. Soc. 81, 2676 (1959). C.A. 54, 7528d (1960)

$CF_2=CFCF=CH_2$ elastomeric below 0°

Jacobs, T.L., and Bauer, R.S., J. Am. Chem. Soc. 78, 4815-16 (1956) C.A. 51, 2525c (1957)
Tetrafluoroallene. Prep and polymerization

Jacobs, T.L., and Bauer, R.S., J.Am.Chem. Soc., 81, 606-10 (1959) C.A. 53, 16952d (1959)
Synthesis and polymerization of tetrafluoroallene

Jones, F.B., and Coleman, L.E., J.Polymer Sci. 28, 242 (1957) C.A. 55, 6025f (1961)
Copolymerization of $CF_2CHCF_2CHCF_2$, $CF_2=CFCF_2CFClCF_2Cl$

$CF_2=CFCF_2CF=CF_2$, $EtO\overbrace{C=CFCF_2CF_2}$

Kahrs, K.H., et al., U.S. 2,919,263. C.A. 54, 7237i (1960)
CTFE polymerized with $CF_3-CH=CH_2$

Kazanskaya, V.F.; Klimona, O.M.: Izv. Vyssk, Ucheb. Zaned., Khim. Khim. Tekhnal 9(4), 641-4 (1966) Russ., C.A. 66, 54798x.
Polymerization of vinylene carbonate in aqueous soln.

Khachaturov, A.S., at al., C.A. 65, 13916h
Study of rubbers containing fluorine by NMR

Khachaturov, A.S.; Vol'kenshtein, M.V.; Dokukina, A.F.: Vysokomol. Soedin. Ser. A, 9(12), 2574 (1967), C.A. 68, 60016y.
Molecular motion in p-(perfluorovinyl) toluene-styrene copolymer.

Khattab, Ghazi, C.A. 64, 6757d
Polymers and copolymers of α-olefins containing the CF_3 group.

Klebanskii, A.L., and Timofeev, O.A., C.A. 54, 8131e (1960)
Polymerization of hexafluorobutadiene

Kliman, N., and Lazar, M., C.A. 54, 10390d (1960)
Copolymers of DTFE with vinyl chloride and vinylidene chloride

Knobloch, F.W., J. Polymer Sci. 25, 453-64 (1957). C.A. 52, 6267b (1958)
Polymers and copolymers of N-(1,1-dihydroperfluoroalkyl) acrylamides

Koleshikov, G.S., Avetyan, M.G., C.A. 53 6056h (1959)
$CHF=CCl_2$, CHFCHCl, $CHFCBr_2$ polymers

Koleshikov, G.S. and Mateera, N.G., C.A. 54, 17941b (1960)
Polymers of CH_2CHCF_2Cl

Kometani, Yutaka; Yoshimura, Tatsushiro; Fujii,Tsuneo. (Daikin Kogyo Co. Ltd) Japan 6804,866(Cl.26B14) CA 69, 19768c
Stabilized and highly concentrated poly(fluoroolefin) emulsions.

Khramchenkov, V.A., C.A. 59, 4039c (1963)
Radiation-induced polymerization of fluorolefins.
$CF_3CF=CH_2$, $CF_3CH=CHF$, CF_3CHCF_2, $CH_2C(CF_3)_2$

Krause, S., et al., J. Pol. Sci., Pt. A. 3, 3573(1965)
T_g of some acrylic polymers

Krbekyan, G.E., Sinanyam, E.G., and Akopyan, A.N., C.A. 59, 12927e (1963)
Copolymerization of trans-2,3,4,5-tetrachlorohexa-1, 3,5-triene

Krespan, C. G., (to Du Pont), U.S. 2,938,889. C. A. 54, 20327g (1960)
Use of PbF_4, AgF_2, CoF_3 in AsF_3 to polymerize CF_2CF_2 and copolymerize with $F(CF_2)_nCF=CF_2$.

Landrum, B. F., and Herbst, R.L., Jr., (to 3M), U.S. 2,951,783. C. A. 55, P 1090h (1961)
CTFE - diallyl maleate copolymers as adhesives

Lazar, M., J. Polymer Sci. 29, 573 (1958)
Effect of solvent on the polymerization of chlorotrifluoro-ethylene.

Lo, E. S., (to 3M), U.S. 2,837,503. C.A. 53, 1805b (1959)
1,1,1-Trifluoro-3-trifluoromethyl-2-butene elastomers copolymerized with 1,1,2-trifluorobutadiene and 1,1,3-trifluorobutadiene. Flexible at -28°C.

Lo, E.S., (to 3M), U.S. 2,970,988. C.A. 55, 12938a (1961)
Polymers of $CF_3CF=CH_2$

Lundin, B. N.; Kolenko, I.P.; Burde, N.C.; Maksimov, A.A.: Tr. Inst. Khim., Akad. Nauk SSSR. Ural. Filial, No. 13, 115-17 (1966), C.A. 68, 59947w.
Synthesis of m-trifluoromethylstyrene and its polymerization with the presence of Bz_2O_2.

3M, Brit. 856,469. C. A. 55, 14990f (1961)
Fluorine-containing vinyl compounds with Ziegler catalysts. CF_2CFCl; 1,1,3-trifluorobutadiene; 1,1-difluorobutadiene, CH_2CF_2

3M, WADS TR 52-197, Pts 1-6. 1952-1956.
Polymers containing $CF_2=CFH$, CF_2CFBr, $1\text{-}C_4F_8$, $1\text{-}C_9F_{18}$

3M, U. S. Army Contract No. DA-19-129-ZM-1043. Report for period October 15, 1957 - August 15, 1960
Studies included C_3F_6 and $CF_3CH=CH_2$

3M, (by James D.Groves) FR. 1,473,451, March 17, 1967, C.A. 67, 100963t.
Fluorine-containing acrylate esters.

Madorsky, S.L., Hart, V.E., Strauss, S., and Sedlak, V.A., J. Res. NBS 51, 327 (1953)
Thermal degradation of $(CF_2CF_2)_n$, $(CF_2CHF)_n$, $(CF_2CH_2)_n$, $(CFHCH_2)_n$

Maillochaud, J., and Riou, M., Fr. 1,140,964. C.A. 53, 20913b (1959)
Purification of poly(fluoroolefins) and poly(chlorofluoroolefins). Treat aqueous suspension of polymer with oxidizer.

Maksimov, V. L., et al., C.A. 65, 9044f
Molecular structure and NMR spectra of fluorinated polystyrenes

Malkevich, S.G., and Chereshkwich, L.V., C.A. 55, 2176a (1961)
p-Fluorostyrene and 2,5-difluorostyrenes

Manno, P.J., C.A. 63, 1878h
Radiation induced polymerization of fluorine-containing monomers. CF_2CFCl/C_2H_4 copolymer

Mantell, R.M. and Hoyt, J.M., (to 3 M), U.S. 3,043,823. C.A. 57, 12719b (1962)
Emulsion polymerization of fluorinated monoolefins. Standard system, except that 5 pts/150 of CS_2 added.

McBee, E.T., Hill, H.M., and Bachman, G.B., I and EC 41, 70 (1949)
Polymerization of CH_2CF_2 and CF_2CCl_2

Morton, M., Inst. of Rubber Research, AF 04(611)-9694
Project No. 750G
Irradiation of fluorine-containing olefins

Muramatsu, H., Iwasahi, M., and Baba, H., C.A. 57, 13975c (1962)
Polymerization of trifluorochloroethylene. Carboxylic end groups in poly(trifluorochloroethylene)

Natta, G., et al., J. Pol. Sci. Pt. A. 3, 4263 (1965)
Isomorphism phenomena in systems containing fluorinated polymers and in new fluorinated copolymers

Noland, J.S., (to Am. Cy.) U.S. 3,207,733. C.A.63, 1829f
Homopolymers of α-fluorostyrene

Overberger, C.G., and Davidson, E.B., J. Poly. Sci. 62, 23 (1962)
Monomer and polymers containing the CF_3-group $CF_3CH{=}CH_2$, $CF_3CH_2CH{=}CH_2$, $CF_3(CH_2)_2CH{=}CH_2$, $CH_3CH(CF_3)CH{=}CH_2$, and $CH_3CH(CF_3)CH_2CH{=}CH_2$

Panov, E.M., et al., Doklady, 145, 1028 (1962)
Fluorine-containing divinyl benzenes

Parrod, Jacques; Hugelin, Christiane. C.R.Acad.Sci., Paris,Ser.C. 267(6), 464(1968). C.A. 69 (24), 927248x
Polymerization of β-fluorostyrene and properties of the polymer.

Pautrat, R., Marteau, J., C.A. 65, 5632d
Reaction of fluoral with cis-1,4-polyisoprenes

Pennsalt, WADC TR 57-436. ASTIA Doc. No. AD 142116, November 1957
Polymers containing CH_2CFCl, $CHFCFCl$, CF_2CHCl, CF_2CCl_2 $C\text{-}C_4F_6$, CF_2CMe_2, vinyl and trifluorovinyl halocyclobutanes (which copolymerized only with reluctance)

Powell, J.A. and Graham, R.K., J.Pol. Sci., Pt. A. 3(10) 3451 (1965)
Polymerization studies on methyl and ethyl α-fluoromethylacrylate

Pritchard, J.G., et al., C.A. 64, 16008a
Fluorine NMR of poly(vinyltrifluoroacetate)

Prober, M., J. Am. Chem. Soc. 72, 1036 (1950)
Decreasing reactivity to polymerization in the series: CF_2CFCl, CF_2CCl_2, $CFClCFCl$, CCl_2CClCF_3, $CF_3CClCClCF_3$, $C\text{-}C_4F_6$, $\overline{CF_2CF_2CF_2CCl{=}CCl}$

Pummer, W.J., and Wall,L.A. SPE.Trans. 3(3), 220 (1963)
$CF_2CFO\phi$ and $CF_2CFOC_6F_5$

Pummer, W.J., Wall, L.A., C.A. 65, 7279b
Perfluoropolytolylenes

Rausch, D.A., Coleman, L.E. Jr., and Lovelace, A.M., J.Am.Chem. Soc. 79, 4983-4 (1957)
The preparation and polymerization of perfluoroalkyl propenyl ketones

H. L. Roberts, J.Chem.Soc. 4538-40 (1964)
Addition of $(CF_3O)_2$ to C_3F_6 to give mainly telomers.

E. Rostonskii and L. Rubinovitch, C.A. 61, 1950c
Acrylates with omega-H fluoro-alcohols.

Schertler, Paul H. Nat.Acad.Sci.-Nat.Res.Counc.Publ. No.1578 53-9(1968) C.A. 69(6), 19708h
The relation between dielectric constant and nature of the fluoroalkyl group in poly(fluoroalkyl acrylates) was studied.

Shashkov, A.S., et al., C.A. 64, 16007h
NMR study of CF_2=CFH and CH_2=CF_2 copolymers

Sianesi, D., and Caporiccio, G., C.A. 58, 9237c (1963)
Stereospecific polymerization of perfluoroolefins

Sianesi, D., and Caporiccio, G., Belg. 618,320. C.A. 58, 9247g (1963)
Stereopolymerization of fluoroolefins

Sianesi, D., and Caporiccio, G., C.A. 62, 13249c
Polymerization of CH_2=$CHCF_3$ with $Ti(OR)_4$

Skinner, W.A., Bishop, E., Tieszen, D., and Johnston, J.D., Ind. Eng. Chem. 51, 1359-60 (1959)
Synthesis and polymerization of 3,3,3-trichloro-1-propene

Sorkin, Howard (to Air Reduction Co.) U.S. 3,394,115 (Cl.260-89.5) C. A. 69(16), 59694g
Preparation and polymerization of 2-(2,2,2-trifluoroethoxy) ethyl acrylate.

Sterling, G. B., (to Dow Chemical Co.), U.S. 3,025.277. C.A.57, 1015b (1962)
Trichlorostyrene copolymers

Sterling, G.B., (to Dow Chemical Co.), U.S. 3,069,388. C.A. 58, 5852b (1963)
$CF_3CH=CH_2$ copolymers

Sterling, G.B. (to Dow) U. S. 3,240,757 C.A. 64, 17800h
Copolymers of $CF_3C(CF_3)=CH$ and vinyl monomers

Thanos, W.M., and O'Shaughnessy, M.T., J.Polymer Sci. 11, 455 (1953)
Kinetics of $(CF_2CFCl)_n$ formation

Timmerman, Robert, SPE Tech. Papers 7, Session 24, Paper No.3 (1961)
Irradiation of $(CF_2CF_2)_n$, $(CH_2CF_2)_n$, and $(CH_2CHF)_n$

Tumac, F., Harriman, L.W., (to Dow) U. S. 3,244,684
C.A. 64, 17803c
Polymerization of CTFE

Votinov, M.P.; Kosobutskii, V.A.; Gorshkova, I.A. Zh.Strukt. Khim. 9(4), 698 (1968); C.A. 70(2), 4735m
NMR spectra were determined for styrene copolymers with $p\text{-}CH_2=C(CH_3)C_6H_4CF=CFCl$, $p\text{-}C_6H_5OC_6H_4CF=CFCl$, or $p\text{-}CFCl=CFC_6H_4CF=CFCl$ in CCl_4 solution.

Wakefield, L.B., IEC 43, 2363 (1951)
$CH_2=CFCFCH_2$, Syntheses, polymerization, T_g = 1°C

Wall, L.A., and Straus, S., J.Research NBS 65-A, 227(1961).
C.A. 55, 19428f (1961)
Pyrolysis of fluorocarbon polymers. $(CF_2CF_2)_n$, $(C_3F_6)_n$, and $(CF_2CFCl)_n$

Wilson, C.W., and Santee, E.R., C.A. 63, 694d
NMR analysis of poly(VF_2) and poly(CH_2CHF)

Wall, L., U.S. 3,192,190. C.A. 63, 7135g
Poly(perfluorostyrene)

Yakubovich, A. Ya., et al., C.A. 59, 11377c (1963)
Polymers and copolymers of $CF_2CF\Phi$

III. A. Fluorine-Containing Polysiloxanes

Dolgoplosk, et al., C.A. 60, 745h (1964)
SiO- or SiOSiO in backbone, $-CH_2CH_2CF_3$ side group. Amyl groups raise T_g (from -70 to +10°), increase tensile strength.

Dow-Corning Corp., Belg. 658,944. C.A. 64, 11249g
Fluoroalkyl siloxanes. Siloxane polymers

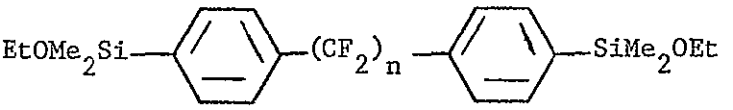
Dow-Corning Corp., Brit. 1,014,156. C.A. 64, 6783d
Organosilicon compounds

Dow-Corning Corp., Germ. 1,208,890. C.A. 64, 12839b
Polysiloxanes and halogenated polysiloxanes

Dow-Corning Corp., Neth. Appl. 6,503,248. C.A. 64, 6871e
Heat stable organosilicon elastomers

Dow-Corning Corporation., Neth. Appl. 6,604,898 (C1.C.08g), October 17, 1966, C.A. 66, 38694e
Fluorinated siloxane copolymers

Fugua, S.A., and Silverstein, R.M., NASA, Doc. N63-15, 280, 39 pp (1962) C.A. 60, 741d (1964), J.Org.Chem. 29(2), 395(1964)



n = 2,3

Fuqua,S and R. Silverstein, C.A. 61, 10849b
Rigid polymer obtained from 1,2-bis [p-(ethoxydimethylsilyl) phenyl] - tetrafluoroethane

G.E. Brit. 980,109 . C.A. 63, 18306h .
Trifluoromethylphenyl polysiloxanes

Holbrook, G.W. Gordon, A.F., and Pierce, O.R., J.Am.Chem. Soc. 82, 825-6 (1960). C. A. 54, 12641f (1960)
Cyclodimerization of vinyl silicon compounds with CF_2CFCl and subsequent polymerization

Holbrook, G.W. (to Dow-Corning Corp.) Fr. 1,359,397; C.A. 62, 4181c
Siloxane polymers containing trifluoropropyl substituents.

Kanner, B., and Reid, W.G., Am. Chem. Soc., Div. Polymer Chem., Preprints 2, No. 1, 99-104(1961). C.A. 57, 15349c (1962)
Graft copolymers of fluoroolefins with dimethylsilicones

Molchanov, B.V., et al., C.A. 65, 7287b
Synthesis and properties of poly[phenyldimethylmethyl (γ trifluoropropyl)] siloxanes

Nametkin, N.S., Vdovin, V.M. and Zav'yalov, V.I., C.A. 63, 4489e
Poly(dimethylsilylene) T_g = -100°

Pierce, O.R., et al., I.E.C. 52, 783 (1960). C.A. 54, 25933a (1960)
Synthesis and polymerizations. LS-53 $T_{brittle}$ -90°F

Pierce, O.R., Holbrock, G.W., Johannson, O.K., Saylor, J.C., and Brown, E.D., Ind. Chem. Eng. 52, 783-4 (1960). C.A. 54, 25933a (1960)
Polymerization of $(RCH_2CH_2SiMeO)_3$ where R is CF_3-, C_2F_5-, or C_3F_7- wide temp. range

Polmanteer, K.E., et al., U.S. 3,050,492 (to Dow-Corning Corp.), C.A. 57, 13948i (1962)
Incorporation of fluoroalkyl substituted organosiloxane units into conventional organosiloxane rubbers low temp. flex retained.

Schiefer, H.M., C.A. 64, 19269g
Trifluoropropyl halophenyl substituted silicone copolymers

Steward, O.W., Pierce, O.R., J.Org. Chem. 26, 2943 (1961)
3-(Fluoroalkoxy)propylpolysiloxanes

Schweiker, G.C. and Robitschek, Paul, U.S. 3,016.360. C.A. 56, 7480c (1962)
Stable carboxylic elastomers containing fluorine

B. Fluorine-Containing Polyesters

Fein, Marvin M.; O'Brien, Eugene L. (to Thiokol)
U.S. 3,332,902 (Cl. 260-31.2) July 25, 1967, Appl November 30, 1964, 3 pp., C. A. 68, 50809v.
Fluorine-containing polyesters.

Freeman, Ronald R., U.S. Dept. Com. Office Tech. Service. AD 275,520, 17 pp(1962). C.A. 60, 739e (1964)
Aromatic diacids (or chloride) and hexafluoro-1,5-pentanediol-, rubbery polymer

Gouinlock, E.V., Jr., Verbanic, C.J., and Schweiker, G.C., J. Appl. Polymer Sci. 1, 361-70 (1959). C.A. 53, 23035g (1959)
Dibasic acids with hexafluoropentanediol

Hollander, J. and Woolf C. to Allied. U.S. 3,177,187. C.A. 63, 500h
Polymers of CH_2=CHCOOCH(CF_2Cl)$_2$

Korshak, V.V., et al., C.A. 64, 8321g
Heterochain polyesters. Fluorine-containing polyarylates

Marden, H.L., C.A. 63, 13444a
Perfluoroalkylmethacrylate polymers

Ottmann, G.F., (to Olin Mathieson Chem. Co.) U.S. 3,044,988. C.A. 57, 12724i (1962)
Fluorinated glycol polyesters

Polmanteer, K.E., and Brown, E.D., (to Dow Corning Corp.) U.S. 3,050,492. C.A. 57, 13948i (1952)

Schweiker, G.C., and Robitschek, P., J.Polymer Sci. 24, 33-41 (1957)
Increase in fluorine content raises brittle temperature

Schweiker, G.C., and Robitschek, P., U.S. 3,016,360. C.A. 56, 7480c (1962)
Stable carboxylic elastomers containing fluoride

Severson, W.A. (to 3M) U.S. 3,240,800, C.A. 64, 17839a
Fluorinated diol polesters based on $(HOCH_2CF_2CF_2)_nO$

C. Miscellaneous Polymers

Gosnell, R.; Hollander, J., J.Macromol.Sci.Phys. 1(4) 831 (1967) C.A. 69(6), 19645k
Synthesis of monomers, and polymerizations leading to LOX-resistant, fluorine-containing polyurethane elastomers.

Gosnell, R.; Hollander, J.
Synthesis of Fluorinated Polyurethanes in "Proceedings of the NASA-Case Conference on the Properties of Polymers at Cryogenic Temperatures,Cleveland, Ohio, Apr. 25-27, 1967." pp 279-298, Marcel Dekker, Inc. 1968
NASA reference C06 A69-16498
Synthesis, compounding, curing, and evaluation of highly fluorinated polyurethanes as adhesives for use in contact with liquid oxygen.

Kercha, Yu. Yu., Ryabokon, L.I.; Malichenko, B.F. Sin. Fiz.-Khim. Polim. 1968(5), 198 C.A. 70(2), 4917x
The effect of F in polyurethanes [-$HNCH_2(CF_2)_4CH_2NHCO_2$-$(CH_2)_6O_2C$-] and [-$HN(CH_2)_6NHCO_2H_2(CF_2)_4CH_2O_2C$-]$_n$ on the ability to crystallize was studied by DTA.

Malichenko, B.F.; Sopina, I.M. Vysokomol. Soedın., Ser.B. 10(6), 468 (1968). C.A. 69 (14), 52541W
Fluorine-containing polyureas by interfacial polycondensation of $H_2NCH_2(CF_2)_4CH_2NH_2$ and a diisocyanate

Yakubovich, A. Ya., Gitina, R.M., C.A. 65, 9033e
Preparation of fluorinated polyamides

IV. Polymers with Heteroatoms in Backbone

A. C - O

Allied Chem. Corp., C.A. 62, 11782f
Oxetanes. $CF_3COCF_3 + CF_2=CXY \rightarrow$

Allied Chem., Belg. Patent 671,439, C.A. 65, 8875b
Telomers for C-O-C in backbone. Polyfluoro-oxetanes

Allied Chem. Corp., Neth. Patent 6,503,339
Copolymers of $(CF_3)_2C=O$ and $c\text{-}C_4F_6$

Barnaba, P., et al., C.A. 64, 3699e
Poly(tetrafluoroethylene oxide)

Barney, Arthur L., U.S. 3,067,173. C.A. 59, 10310b (1963)
Hydroperfluorovaleraldehyde polymer

Bureau of Industrial Technics, Japan. C.A. 64, 5233a
Aldehyde polymerization

Burnop, V., C.A. 63, 13425g
Polyacetone

Cairns, T.L., Cline, E.T., and Grahm, P.J., (to duPont)
U.S. 2,828,287 C.A. 52, 10641e (1958)
Fluoroaldehyde-modified polyoxymethylene

Case, L.C., and Todd, C.C., J.Poly.Sci. 58, 633 (1962)
Polyperfluoroalkyl oxetanes

Castille, Y.P., Stannett, V., J.Pol.Sci., Pt. A-1 (4)
2063 (1966)
Radiation-induced copolymerization of formaldehyde and styrene

Castillo, Y.P. and Stannett, V., Pol. Prev. 2(2) 39(1966)
Radiation-induced copolymer of styrene and CH_3CH_2O

Cook, E.W.; Erickson, C.A.; Gannon, J.A. (FMC Corp.)
Synthesis of High-Strength Chemical Resistant Elastomers for Extreme Temperature Service, Contract DA 19-129-AMC-147(N).
Synthesis of new fluorinated elastomers serviceable at low temperature. Condensation products of polyfluorinated diols with fluorocarbon diene.

du Pont, Brit. 809,754. C.A. 53, 19452 g (1959)
Produced an acetylated fluorinated (by copolymerizing with CF_3CHO) polyoxymethylene with good mech.prop. from -78 to 200°

Belg. 616,256 (to duPont), C.A. 59, 11169f
Poly(propylene epoxide)

duPont, Neth. Appl. 6,413,124, C.A. 64, 12837g
Polyfluoroketone polymers

duPont, Neth. Appl. 6,514,549, C.A. 65, 12,356g
New copolymers of polyfluoroaldehydes and alkenes radically initiated

duPont, Brit. 1,034,495, C.A. 65, 9123c
Polyfluoroketone-epoxide copolymers and dioxolanes

E.I. duPont de Nemours & Co., Neth. Appl. 6,607,679, December 5, 1966, C.A. 67, 100588z.
Fluorocarbon ethers and their polymers.

Etienne, Y., C.A. 51, 15992e (1957)
Polymerization of 3,3-bis(fluoromethyl)oxetane

FarbwerkeHoechst A.-G. , Fr. 1,391,539. C.A. 63, 11809b
Chlorine-containing polyacetals

Furukawa, J. and Saegusa, T., U.S. 3,183,210. C.A. 63, 18299d
Polymerization of aldehydes of organometallic compounds

Furak'awa, et al., C.A. 64, 8317a
Copolymerization of CO with alkyleneoxides

G.E., Jaquiss, D.B.G. U.S. 3,220,978. C.A. 64, 8427h
Fluorine-containing organic polycarbonates

V. Ginsburg, et al, C.A. 59, 5008f

$C_2F_4 + O_2 + (CF_3)_2N_2 \qquad (C_2F_4O)_n$ oil

Howard, E.G. (to duPont) Brit. 1,020,678, C.A. 64, 17740d
Fluoro ketone copolymers

Howard, E.G. and P.B. Sargeant. J.Macromol. Sci. Chem. 1(6), 1011 (1967) C.A. 68, 114997q
The free radical chemistry of fluoroketones II Reaction with unsaturated compounds.
Copolymerization through CO gives polyethers

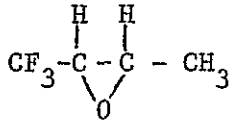
Husted, D. and Ahbrecht, A., Brit. 719,877. C.A. 49, 10667b
Poly(fluorocarbon aldehydes)

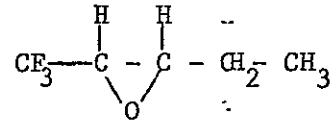
Ilyina, D.E., Krentsel, B.A., and Seminido, G.E., Int'l. Symposium of Macromolecular Chemistry, Paris July 1-6, 1963. Paper No. 38

$$CCl_3CHO \xrightarrow[n\text{-buLi}]{-78^\circ} \left[\begin{array}{c} CCl_3 \\ | \\ C-O \\ | \\ H \end{array}\right]_n$$

Japan Synthetic Chemical Ind. Co., C.A. 63, 18299b and f, 18300c
Polyacetaldehyde

Jones, F.B., Stickney, P.B., Coleman, L.E., Jr., Rausch, D.A., and A.M. Lovelace, J. Polymer Sci., 26, 81-8 (1957). C.A. 52 5875d (1958)
Polymerization of some fluorine-containing olefin oxides





Kazakov, V.Ya.; Gyul'nazarova,E.V.; Savel'ev, L.A.; Usmanova, S.Yu.; Muromskaya, V.K. USSR patent 211,090 (Cl. C 08f). C.A. 69(4), 10935x
Perfluoropropylene copolymerized with molecular oxygen, which is bubbled through in the presence of UV gives perfluoropoly(propylene oxide).

Krespan, C.C.,Cand E. N. 43(41), 80(1965)
Free radical reaction of fluoroketones

Lett, M.H., Bauer, F.W., to Allied Chem. Corp.
Belg. Patent 672,045, C.A. 65, 10,691a
Copolymers of fluoro-ketones

N. Madison and D. Miller, Research on the Synthesis of Fluorine-containing Polymers. Part I Apr. 1964. Dow Chemical Company. AF 33(657)11254
Copolymerization of CH_2O with CF_3CF-CF_2, $(CF_3)_2C=CF_2$,

$(CF_3)_2C=O$ and C_2F_4 .

Madison, N., and Miller, D., Dow Chem. Co., July, 1965, ML-TDR-64-140, Part II
Synthesis of fluorine-containing heteroatomic polymers

3 M Company, U. S. Army Contract No. DA-19-129-QM-1043. Report for the period October 15, 1957-august 15, 1960.
Polymerization of $CF_3\underline{CHCH_2}O$, $C_5F_{11}\underline{CFCF_2}O$, C_3F_7CHO

3 M French Patent 1,410,554, C.A. 65, 2371h
Perfluorinated polyethers. The Hg^{++} salt of

$$O(CF_2CF_2CO_2H)_2 \xrightarrow{300\text{-}400^\circ} \{O(CF_2)_4-\}_n$$

V. McLaughlin and J. Thrower, Chem. Ind. (London) 1557 (1964) C.A. 62, 5347f
Polymers of $p\text{-}CF_3C_6F_4OK$

Milian, A.S., Jr., (to duPont), U.S. 3,214,478. C.A. 63, 1830b
Perfluoro-olefin epoxide polyethers

Miller, D.L.; Madison, N. L.; Rausch, D.W. (to Dow Chemical Co.), U. S. 3,330,808, C. A. 67, 64909u.
Copolymers of perfluoroolefins and aldehydes.

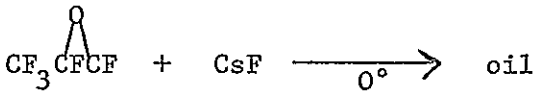
Minister of Technology, London (by V.C.R. McLoughlin and John Thrower) Brit. 1,110,232 (Cl.C. 07c) C. A. 68 (25) 114245t

Salts of perfluoro(alkyl phenols) are prep'd, and on heating convert to polymers consisting of benzene nuclei linked by p-difluoromethyleneoxy or alkylfluoromethyl-eneoxy bridges.

Moore, E.P., et al. (to duPont), Fr. Pat. 1,275,799(1961)

Polymers of perfluoro(propylene oxide)

Moore, E.P. (to E.I. duPont de Nemours and Co.), Fr. 1,359,526; C.A. 62, 4181a



Moore, E.P. (to duPont), Fr. 1,362,548. C. A. 63, 7897b

Fluorinated polyethers

Morton, M., AF Contract 04(611)-9694

Low temperature polymerization studies. Polymerization of CF_3CHO

Moyer, W. W., Grev., D. S., J.Pol.Sci. B, 1, 29(1963)

Cyclic polymerization of glutaraldehyde

Ponomarenko, V.A.; Khomutov, A.M.; Zadorazhnyi, N.A. Izv.Akad.Nauk SSSR,Ser.Khim. 1968 (8), 1847 C.A. 69(26), 107110n

Copolymerization of trifluoropropylene oxide with hydro-carbon epoxides in the presence of ferric chloride.

Pummer, W. L. and Wall, L.A., J.Research Nat'l. Bur. Std. A68(3)277-86(1964); C. A. 61, 1951g (1964)

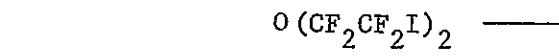
Perfluorophenylether and related polymers

Rees, R. W., U. S. 3,182,101. C. A. 63, 4477b

Lewis acid catalized polymerization of CCl_2HCHO

Rice, David E. J. Polym. Sci. Part B 6(5), 335(1968) C.A. 69(4), 10806f

Preparation of perfluoroalkylene oxide polymers by iodide coupling reactions.



Prep of monomer described, polymer having M.W. $4x10^4$ was a weak elastomer, T_g -65°.

Rosen, I., et al., C. A. 64, 3768h

Poly(chloroaldehydes) hydroxy terminated

Rosen, I., Sturm, C.L., J.Pol. Sci., Pt. A, 3, 3741(1965)

Poly(chloroaldehydes)

Sedlmeier, J., Ger. 1,189,714. C.A. 63, 1973h
Elastomeric poly(chloroacetaldehydes)

Societe Nationale des Petroles d'Aquitaine, Fr. 1,445,596 (Cl. C. 08f) July 15, 1966, C. A. 66, 47089p (1967).
Dithiadienes containing the group - $CH_2S(CH_2)_nCH_2S$ - were polymd. with one or more α-olefins to give vulcanizable polymers.

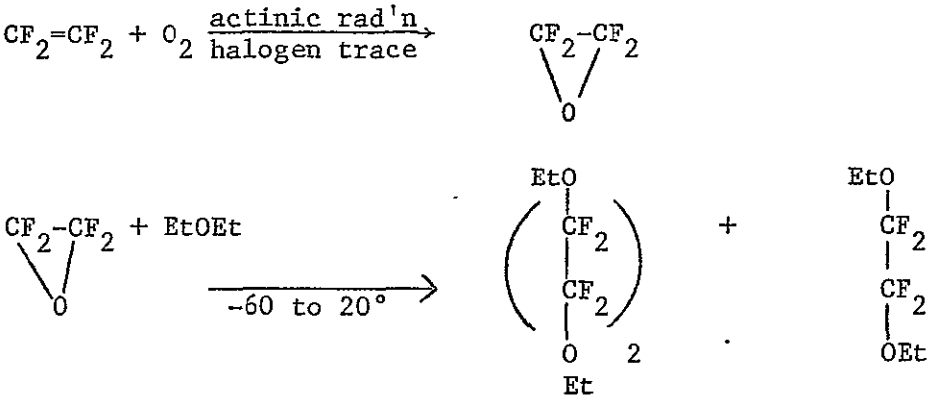
Stamatoff, G. S., and Wittmann, J.W. (to duPont), Fr. 1,394,897. C.A. 63, 18297b
Fluoroketone-aromatic hydrocarbon condensation polymers

Trischler, Floyd D.; Hollander, Jerome, Amer. Chem. Soc. Div. Polym. Chem., Preprints 8(1), 491-6 (1967) (Eng.), C. A. 66 105261b.
The preparation of fluorine-containing polyethers

Vandenberg, E. J. (to Hercules) U. S. 3,208,975, C.A. 63, 18297f
Polymerization of aldehydes with chelating organoaluminum catalyst

Warnell, J. L., Ger. 1,191,576. C. A. 63, 7135a
Poly(tetrafluoroethylene oxide)

Warnell (to duPont), U.S. 3,272,871, C.A. 65, 16772a
Fluorocarbon-hydrocarbon polyethers



Weissermel, K., and Frischkarn, H., U. S. 3,210,298, C.A. 64, 6618d
Polymers of substituted oxacyclobutanes

Wolf, C. N., C. A. 63, 160504f
H_2CO copolymers with butadiene

B. C - S

Anderson, B.C., C.A. 64, 19802f
Preparation of poly(perfluorothioisobutyraldehyde)

Asahi Chem. Co., Fr. 1,400,828. C.A. 64, 2196c
Polythioacetals

Barney, A.L., et al., C.A. 65, 18686e
Free-radical polymerization of thiocarbonyl fluorides

Belg. Patent 656,508, C.A. 64, 19949c
Polymers by reaction of mono and dialdehydes and derivatives with sulfur chloride or bromides

Du Pont, Brit. 857,649. C.A.55, 11918h (1961)
Low polymer of CF_2S

Du Pont, Brit. 877,834. C.A. 56, 4960e (1962)
Thiocarbonyl fluoride polymers

Du Pont, U.S. 3,097,236. C.A. 59, 13825f (1963)
Preparation of fluorine-containing thiocarbonyl compounds

Goethals, E., C.A. 65, 3965c
Sulfur-containing high polymers. A review.

Harris, J.F., Jr., (to duPont), U.S. 3,047,545. C.A. 57, 13993e (1962)
Polymers of polyfluorothioaldehydes

Kealy, T.J., (to duPont), U.S. 3,069,379. C.A. 59, 1489f(1963)
Fluorothioketones and their polymers.

Middleton, W. J., U.S.3,069,395. C.A. 59, 1493g(1963)
Halothioaryl fluorides and polymers

Middleton, J.W., et al., C.A. 63, 483c
Polymerization of fluorothiocarbonyl compounds

Middleton, W.J. (to duPont) U.S. 3,240,765 C.A. 64, 19826a
Thiocarbonyl fluorides and their polymers

Smith, Harry A. U.S. 3,397,188 (Cl.260-79) C.A. 69(20), 77976e
Poly[thiophenylene(difluoromethylene)], which has excellent thermal stability, is prepared by homopolymerization of α-α-α-trifluoro-m-toluenethiolate.

Walter, H.C., (to duPont), U.S. 3,032,537. C.A. 57, 7441i (1962)
Anionic polymerization of thiocarbonyldifluoride

Wilkinson Sword Co. C.A. 63, 13513e
Fluorination of poly(thiocarbonyl fluoride)

Woodhams, R.I., C.A. 67, 32935h, Rep. Progr. Appl. Chem. 50, 480-4 (1965) (Eng.).
Poly(alkylene sulfides) review including thiocarbonyl fluoride elastomers and perfluoroalkylene episulfide polymers.

C. N - O

Andreades, S. (to duPont) U.S. 3,248,394, C.A. 65 15392c
Reactions of nitrosyl fluoride with perhaloolefins. ($CF_2=CF_2$ and $CF_3CF=CF_2$)

Barr, D.A., Haszeldine, R.N., and Willis, C.J., C.A. 54, 2797e (1960)
CF_3NO + C_2F_4

Barr, D.A. Haszeldine, R.N., and Willis, C.J., J.Chem.Soc., 1961, 1351. C.A. 55, 13404i (1961)
CF_3NO polymers

Cotter, J. Z.; Knight, G. J. (Roy. Aircraft Estab. Farnborough, Eng.) "Identification & Origin of the Volatile Components of Freshly Milled Nitroso Rubber & Carbon Black." AD 482753, U. S. Gov. Res. Dev. Repts. 41 (17), 72 (1966), C. A. 67, 22631s.
Scheme proposed which explains the formation of $(CF_3)_2NH$, $CF_2=N-CF_3$ and probably CF_3NCO.

Crawford, G. H., Rice, D. E., and Landrum, B. F., J. Poly. Sci. Pt. A 1, 565 (1963)
R_fNO elastomers

Crawford, G. H. (to 3M), U.S. 3,213,009. C.A. 64, 6869e
Fluorine-containing nitroso alkanes and their polymers

Crawford, G. H., et al., C. A. 66, 3475d
Nitroso fluorocarbon elastomers. Polymerization mechanism

Crawford, George H.; Rice, David E. (to 3M Co.), C.A. 67, 33659h, U.S. 3,321,454 (Cl. 260-92.1) May 23, 1967
Crosslinkable or vulcanizable halogenated nitroso terpolymers consisting of nitroso alkanes, fluorine-containing monoolefins, and aliphatic nitroso monocarboxylic acids.

Critchley, J.P.; Pippett, J.S. (Royal Aircraft Establishment, Farnborough, Eng.) Report RAE-TR-68026 NASA accession no. N69-14770 STAR 0704 USGRDR 69(6), 66(1969)
A study of perfluoroalkyl and perfluoroaklylene 1,2,4- and 1,3,4-oxadiazoles and derivative thermally stable polymers.

Green, Joseph; Mayes,Nathan; Cotril,Ernest; J.Macromol. Sci., Chem. 1(7), 1387(1967) C.A. 68(20), 87622e (1968)
Aromatic polyfluoronitroso polymers

Green, Joseph, C.A. 67, 22630r, NASA Accession No. N65-33416, Dept. No. AD 461044 (1964) (Eng.).
Nitroso rubber research, development, and production.

Green, Joseph (Thiokol Chem. Corp.), Nitroso Rubber Research Development and Production, 1 March - 31 May 1964, Contract DA-19-129-AMC-69(X).
Preparation processes developed for CF_3CO_2NO, CF_3NO, and the CF_3NO/C_2F_4 copolymer.

Griffin, C. E., and Haszeldine, R.N., Proc. Chem. Soc., 1959, 369-70 C.A. 54, 10382i (1960)
Trifluoronitrosoethylene and its polymers.

Griffin, C.E., and Haszeldine, R.N., J.Chem.Soc., 1960, 1398-1406 C.A. 54, 14217d (1960)
Trifluoronitrosoethylene and its polymers.

Griffis, Charles B.; Henry, Malcolm C., In: National Sampe Symposium on Adhesives and Elastomers for Environmental Extremes, 7th, Los Angeles, Cal., May 20-22, 1964, Society of Aerospace Materials and Process Engineers, 1964, p. 12-1 to 12-15, 9 refs.
Raw nitroso polymer is a 50:50 addition copolymer of CF_3NO and $CF_2=CF_2$. Recipe for rubber using this copolymer.

Griffis, C.B.; Shurtleff, C.W. (Army Natick Labs. Natick, Mass.) "Research Compounding of Nitroso Rubber Terpolymers", AD 635114, U.S. Govt. Res. Devl. Rept. 41 (16), 60-1 (1966), C.A. 67, 22629x.
Crosslinked carboxy nitroso rubber studied by Tg via DTA vs curing agent.

G. B. Griffis and M. Henry, Motr. Synys., Nat'l. SAMPE, 7th Los Angeles (1964). C. A. 62, 5418f
Summary of the chemistry of nitroso rubbers

Griffis, G. B., Henry, M.C., Rubber Chem. & Tech., 39(3), 481 (1966)
Nitroso rubber.

Haszeldine, R.N., and Willis, C.J., Brit. 843,795. C.A. 55, 4027b(1961)
Nitroso elastomers, CF_3NO and $CF_2=CFH$

Haszeldine, R.N., Ger. 1,072,247. C. A. 55, 16015i(1961)
Nitroso polymers, NO + haloolefin $\longrightarrow$ polymer

Haszeldine, R.N., et al., Brit. 982,660. C. A. 62, 10547d
Nitroso polymers

Haszeldine, R.N., et al., Brit. 1,015,781. C.A. 64, 12843c
Polymeric fluorine compounds containing N

Haszeldine, R.N., et al., C.A. 64, 17742g
Copolymers of fluorinated olefins and aryl nitroso compounds.

Haszeldine, R.N., et al., C.A. 64, 17749a
1,1-difluoro allene + R_fNO (+fluoroolefin optional termonomer)

Haszeldine, Robert N.: C. A. 67, 64888m, Ger. 1,237,315 (Cl. C. 08g), March 23, 1967.
Copolymers containing nitrogen and fluorine.

Henry, M. C.; Griffis, C. B.: Nitroso Rubber Handbook (AD 632196), C. A. 67, 65228h.

Lawson, D.D., and Ingham, J.D., J.Polymer Sci. Pt B. 6(3), 181(1968) C.A. 68, 116621S
Fluorine-19 NMR spectrum of nitroso rubber copolymer.

3M, Ger. 1,153,173. C.A. 59, 14126f(1963)
CF_3NO-C_2F_4 copolymerized in aqueous suspension at -50° -0° using LiBr solvent

3M, Brit. 943,224. C. A. 60, 7009c (1964)
Nitroso rubber

Brit. 983,486 (to 3M), C.A. 62, 11932e
Nitroso polymers and monomers

Montermoso, J.C., Griffis, C.B., Wilson, A., and Crawford, C. H., Rubber and Plastics Age, 42, 514(1961). C.A. 55, 18158e (1961).
Vulcanization and properties of nitroso rubber.

Park, J.D., (to 3M) U.S. 3,162,590. C.A. 62, 9010d
Physical properties and preparation of nitroso compounds.

Putnam, R.E., Sharkey, W.H., C.A. 65, 12289a
Fluorodiene. Copolymerization of 1,1,4,4-tetrafluoro-1, 3-butadiene with oxygen and nitric oxide

Rose, J.B., (to I.C.I.), Brit. 789,254. C. A. 52, 9644a (1958)
a solid rubbery polymer from CF_3NO and C_2F_4

Stump, Eugene C.; Padgett, Calvin D. CFSTI 1967, AD-666801
U.S. GRDR 68(10, 48(1968); C. A. 69(24), 97543q
Nitroso rubber terpolymers were prepared using S-containing and carbomethoxy-substituted termonomers. The latter were vulcanizable by peroxides.

Thiokol RMD 5062-Q6 AF 33(657)-11093
$CF_3NO/C_2F_4/ON(CF_2)_3COOH$ cured with $Cr(OOCF_3)_3$

D. Miscellaneous

Bartashev, V.A.; et al. USSR patent 217,638 (Cl. C08g), C.A. 69(20) 77973b
Poly(fluoroalkoxyphosphazenes) are prepared by treating high-mol.-wt. poly(chlorophosphazenes) with preferably lithium fluoroalcoholates.

Dow Corning Corp. Brit. 1,114,198 (Cl. C08g) C. A. 69, 19823s
Polymerization of perfluoroalkyl-substituted triazines. (2,4-bis(bromodifluoromethyl)-6-CF_3 triazines with Hg.

Falk, Robert A.: U. S. Clearinghouse Red. Sci. Tech. Inform., AD 653432 (Avail. CFSTI) C. A. 68(20), 87975x (1968)
Fluorocarbon nitride elastomers: prep & copol. (w/tfe) of $(CF_3)_2C = NF$; also $(CF_2=N)_2$, perfluoro-1.4-diaza-1-butene, others.

Falk, Robert A.: C. A. 68, 87975x, U. S. Clearinghouse Fed. Sci. Tech. Inform., AD 653432.
Fluorocarbon nitride elastomers. Synthesis of new fluorimines led to $(CF_3)_2C=NF$ which was copolymerized with TFE.

Lenton, M.V. (English Electric Co. Ltd. Whetstone, Eng.) Phosphonitrilic Fluoroalkoxide Polymers Prepared for Dir. of Mater. Res. and Develop. [KS/1/0161/CB43(a)2].
Fluoroalkoxy substituted trimeric phosphonitrile ring compounds synthesized. Some polymers from the above are elastomeric.

Lenton, M.V., U.S. Clearinghouse Fed. Sci.Tech. Inform., AD 654658 (Avail CFSTI) C.A. 68(20), 87986b (1968)
Phosphonitrilic fluoroalkoxide polymers.

V. Thermal Properties of Polymers

Abas-Zade, A.K., et al., C.A. 64, 6220f
Thermal parameters of some commercial polymers

Adamec, V. J.Polym.Sci., pt.B 6(10), 687(1968) C. A. 70, 4733j (1969)
Dielectric relaxations process below T_g in atactic polystyrene determinations of β-transition by dielec. loss measurements.

Adams, George, Diss.Abstr.B. 28 (2), 616-7 (1967) Univ. Microfilms Order Nr. 67-6245. C. A. 68(8), 30301v
Crystallization studies of fluorocarbon copolymers.

Allen, G., Proc. Roy. Aust. Chem. Inst. 33(12), 377080 (1966) Eng., C. A. 66, 66512e
The nature of rubber elasticity, a discussion with nine references.

Allen, Geoffrey; Ayerst, R.C.; Cleveland, J.R.; Gee, Geoffrey; Price, Colin. J.Polym.Sci., Part C 1966, No. 23 (Pt.1), 127-9
The effect of the conditions of glass formation upon the density and energy of polystyrene. Enthalpies same, densities different in samples when cooled at one atm. or 1250 atm; related to freezing rotational isomerism at T_g.

Allen, G. et al. C. A. 62, 4190g (1965)
T_g of poly(propyleneoxide) -75°

Anderson, Hugh C., Proc. Toronto Symp.Therm.Anal. 2nd Toronto 1967, 37-57. C. A. 69, 19663q
Recent applications of thermal analysis to the study of high polymers.

Andrews, R.D., Kimmel, R.M., J.Pol. Let., 3, 167-69(1965)
Solid state structure and glass transitions in polyacrylonitrile.

Andrews, R.D.: C. A. 68, 60202s, J.Pol.Sci., Part C No. 14, 261-5 (1966) Eng.
Transition phenomena and solid-state structure in glassy polymers.

Andrews, R. D., Amer. Chem. Soc. Div. Polymer Chem. Preprints 6(2), 717-20 (1965)(Eng.)., C. A. 66, 46682q.
Transition phenomena and solid state structure in glassy polymers.

Andrianov, K.A., and Zhdanov, N.A., C. A. 58, 554g (1963)
Poly(borodimethylsiloxanes), T_g approximately -125°

Angelo, R. J., et al., C.A. 63, 3064b
Multiple glass transitions of block polymers

Araki, Yaskio, C.A. 64, 6773a-d
First and second order transitions in poly TFE

Araki, Y., C.A. 62, 10529d
T_g of TFE by expansion. T_g 115° to 129°

Armeniades, C.D.; Baer, E.; Kuriyama, I. Mechanical Behavior of Poly(Ethylene Terephthalate) at Cryogenic Temperatures in "Cryogenic Properties of Polymers: Proceedings of the NASA-Case Conference on the Properties of Polymers at Cryogenic Temperatures, Cleveland, Ohio, April 25-27, 1967", pp 155-169 Marcel Dekker, New York, 1968
NASA ref C18, A 69-16494

Arzhakov, S.A., et al., C.A. 60, 1336f
Determination of the transition temp. of polymers from the deformation of powders

Atkinson, H.F., Grant, A.A., C.A. 65, 13838b
Lower transition point for poly(methyl methacrylate) at 30-32°C

Ball, G.L., III ; Salyer, I.O.; Pustinger, J.V.; Wilson,H.S. (Monsanto Res. Corp) Report No. USE-NLABS-TR-67-63-CM.,C/OM-31 U.S. Govt. Res. Dev. Repts. 68 C18), 84 AD 672 523
Physical and Rheological Properties of Fluoronitroso Rubbers lists T_g as -49°C, tensile strength 387 psi, ultimate elongation 527%.

Barisov, S.N., Plaste Kautschuek 10, (7), 400-1(1963).
C. A. 60, 1905g (1964)
Cold-resistant polysiloxane elastomers. Phenyls raise T_g, but lower tendency to crystallize.

Barrall, E., et al., C.A. 62, 15458f
Apparatus for detn. T_g by thermal expansion used with DTA

Bartenev, G.M., Vishnitskaya, L.A., C. A. 64, 5274f
Effect of temperature on the viscosity of fluorine-containing rubber

Barton, J.M.: C. A. 68, 78697f, U.S. Clearinghouse Fed. Sci. Tech. Inform., AD 662536, U.S. Govt. Res. Dev. Rep. 69(3), 76 (1968)
Relationship of glass-transition temperature to molecular structure of addition copolymers.

Barton, J.M.; Lee, W.A.; O'Mahoney, Diana.
Royal Aircraft Establishment, Farnborough, England, Report Nr. RAE-TR-67298 CFSTI NASA AD Nr. N 68-29634
"Correlation of the T_g of polyacrylates, polymethacrylates, and polychloroacrylates with their chemical structures."

Beaman, R. G., J. Poly. Sci., 9,479 (1952). C. A. 47, 2573e (1953)
Relation of T_g to T_m.

Beaman, R. G., C. A. 64, 12818f
Correlation and prediction of polyamide glass transitions

Beck, D.L., Hiltz, A.A., and Knox, J.R., SPE Soc. Plastic Eng. Trans. 3(4); 279-85 (1963). C. A. 60, 5704d
T_g's in polypropylene

Beevers, R. G., and White, E.F.T., Polymer Letters 1, 171 (1963)
T_g of acrylonitrile-styrene copolymers. Minimum T_g noted

Belg. 536,033. C. A. 54, 16894e (1960)
Improves the elasticity of natural rubber in the neighborhood of -70°C by adding silicates

Berenbaum, M.B., Rosenthal, N.A., and Lecher, H.Z., C.A. 59, 10327d (1963)
Polysulfide rubbers having improved low-temperature properties

Bianchi, U., C.A. 62, 16399a
Internal pressure changes at T_g.

Bianchi, Umberto; Turturro, Antonio; Basile, Giampiero, J.Phys.Chem., 71 (11), 3555-8(1967) (Eng.), C.A. 67, 117440t.
Pressure effects on glass transition in polymers. II. Factors affecting dTg/dP values.

Boel, Michael: C. A. 68, 40747n, Diss. Abstr. B 28(3), 806 (1967) (Eng.), Univ. Microfilms (Ann Arbor, Mich.), Order No. 6,710,938, 343 pp.
An experimental approach to an advanced understanding of rubberlike elasticity.

Bondi, A., C.A. 64, 12820h
Viscosity and molecular structure. Ref. to reduced effective glass transition temperature

Bowden, P.B. Polymer 9 (9), 449(1968) C. A. 69(24), 97382m
Elastic modulus of an amorphous glassy polymer.

Boyer, Raymond F.: C. A. 68, 50072z, J.Polym.Sci. Part C No. 14, 3-14 (1966) (Eng.).
Introductory remarks for symposium on transitions and relaxations in polymers.

Boyer, R. F., C. A. 60, 7295c
Determination of transition temperature

Boyer, R. F., Rubber Chem. and Tech. 36(5), 1303-421(1963)
Excellent review on the relation of transition temperatures to chemical structure. 201 references.

Braun, G., Kovacs, A.J., C.A. 62, 14886b
Changes in T_g of polystyrene with plasticizer conc.

Bringer, Robert P., Soc. of Aerospace Mater. and Process Engr. National Symp. of Effects of Space Environment on Materials.
Fluorocarbon plastics under the influence of unusual environmental conditions. Effects of exposure to liquid oxygen discussed.

Brunt, N.A., C. A. 65, 7415d
Statistical theory of the glass-rubber transition of high polymers.

Buchdahl, R., J. Polymer Sci. 28, 239 (1958). C.A. 55, 6014g (1961)
Strength properties below T_g.

Bunn, C.W., J. Polymer Sci., 16, 323 (1955)
Chain flexibility, effect of doubly bonded atoms

Busfield, W.K. Polymer 9(9), 479 (1968) C. A. 69(24), 97334x
Thermal degradation of poly(trifluoroacetaldehyde) and methods of stabilizations.

Cessna, Lawrence Clyde, Jr., Univ. Microfilms (Ann Arbor, Mich.), Order No. 66-7569, 172 pp. Diss. Abstr. B 27(4), 1132 (1966) Eng., C. A 66, 38292x.
A study of the fracture of polymers below their glass-transition temperatures.

Chernaya, V.V., and Vol'Chenko, R.L., Uspekhi Khum. 31, 336(1962) English translation p 167-175.
Methods for increasing the resistance of polymers to low temperatures

Chang, Jun Jon., Chosun Kwahakwon Tongbo, 1966(1) 19-21
C. A. 68(8), 30287V
Theory of the glass transition temperature of polymers .

Ch'i, Tsung-Neng, et al., C.A. 63, 14997a
T_g by DTA

Christopher, N.S.J., J.L.Cotter, G.J.Knight, W.W.Right, J.Appl.Polym.Sci., 12(4), 863(1968); C.A. 68, 115157c
Thermal degradation of perfluoropoly(phenylene sulfide)

Cianetti, E., Pecci, G., C. A. 65, 12380e
Thermal analysis in the identification of elastomers

Clampitt,Bert H. and Hughes, Richard,Anal.Chem. 40(2), 449(1968) C. A. 68, 40202C
Differential thermal analysis crystallinities and melting points of ethylene-vinylpyrolidinone copolymers.

Clark, E.S., and Starkweather, H.W., J.Appl.Polymer Sci. 6, 541-2 (1962)
Crystal structure of quenched poly(C_2F_4)

Clark, E.S., Molecular Motion in Polytetrafluoroethylene at Cryogenic Temperatures in "Cryogenic Properties of Polymers" Proceedings of the NASA-Case Conference on the Properties of Polymers at Cryogenic Temperatures, Cleveland, Ohio, April 25-27, 1967" pp 243-248 Marcel Dekker, New York, 1968.
NASA ref C24 A 69 - 16495

Clark, E.S., J.Macromol.Sci.,Phys 1(4), 795 (1968)
C. A. 69 (4), 10741f
Molecular motion in poly(tetrafluoroethylene) at cryogenic temperature.

Claver, G. C., Jr., C.A. 64, 15995h
Chemical and physical methods for the characterization of polymers. T_g discussed

Clough, Stuart B. and Nationaniel S. Schneider (Army Natick Labs., Mass., Clothing & Org. Mat'ls Div.) Tech. Report Jan, 1966-March 1967. N 68-23333# STAR 6(13), 2087 (1968)
Studies on the structure of rubbery polyurethanes via thermal transitions.

Colborne, R. S., J. Macromol.Sci., Phys. 1(3),517(1967)
C. A. 68, 40195c
$T > T_g$ transitions in concentrated polystyrene solutions.

Cowie, J.M.G.; Toporowski, P.M., European Polymer J. 4, 621-5 (1968). U.S.G.R.D.R. 69(6), 70(1969)
T_g of poly(α-methylstyrene)measured over the range mol.wt 1500 to 1.4×10^6. The free volume of a chain end is found to be 85 cubic A, which is ca 1/2 the size of a monomer unit.

Corruccini, R.J., Chem.Eng.Progr. 53, 397-402 (1957). C.A. 51 17267g (1957)
Mechanical properties of metals and alloys, plastics and glass.

Corrucini, R.J., and Gniewek, J.J. (U.S.) Monograph 29, 1-22 (1961). C.A. 55 16854h (1961)

Di Marzio, E., C.A. 62, 4191a (1965)
Mathematical relation of 2nd order transition to cross-linking in rubber.

Di Marzio, E. A., and Gibbs, J.H., J.Polymer Sci. 40, 121(1959) C. A. 54, 25962a (1960)
T_g relations in copolymer systems

Dudek, T. J., C. A. 64, 9890h
T_g of poly(methyl methacrylate)

Duiser, J.A.; Choempff, A.J.: Rheol. Acta 5(4), 276-7 (1966) (Eng.), C. A. 66, 65981c
Normal modes of macromolecules in relation to the rubber-glass transition.

Dunlap, L.H., C.A. 65 17132c
Specific heats of polyvinyl chloride compositions

Durrell, W. S., et al., C. A. 64, 14356b
T_g for Teflon and C_2F_4 copolymers

Dyment, J., and Ziebland, H., J. Appl. Chem. (London) 8, 203-5 (1958). C. A. 52, 15118d (1958)
Tensile strengths of poly(C_2F_4, CTFE, nylon) measured at 20°, -75°, -120°, and -196°. Only teflon retained ductility at -196°.

Edgar, O.B., Ellery, E, C.A. 47, 381f
T_g by penetrometer

Eglin, S. B., et al., NAS8-11406, Second Quarterly 1 Nov.1964 to 31 Jan. 1965.
Development of structural forms for cryogenic applications

Eiermann, K., and Hellwege, K.H., J.Polymer Sci. 57, 97-104 (1962). C. A. 56, 15658h (1962)
Thermal conductivity of high polymers from -180° to 90°C

Eisenberg, A., and Rouira, E., J.Polymer Sci. Pt B 2, (3), 269 (1964)
A new method for the rapid determination of glass transition temperatures, using strain guage

Eisenberg, A.; Yokoyama, T.; Sambalido,Emma: (McGill Univ. Montreal) Contract No. N00014-68-C-0237 Report TR-17; AD 671849 NASA No. N68-32522
Glass transition of poly(acrylic acid) (103°) and -- by extrapolation -- of poly(acrylic anhydride) (140°).

Ellerstein, S., C. A. 63, 6694d
Kinetic parameters of T_g obtained by differential calorimetry.

Ellerstein, S.M., (Polymer Letters) J.Poly Sci. Sec. B 1, 223 (1963)
The glass temperature of random addition copolymers

Ellerstein, S.M., J.Polymer Sci. Pt. B Pol. Let 2, 379-80 (1964)
Glass temperature as a function of molecular weight

Erlikh, I. M.; Nekbendzi, E. Yu.: Plast. Massy 1966 (12) 61-2 (Russ.), C. A. 66, 46679v.
Determination of the glass temperature (of polymers) by strain-gage method.

Faucher, J. A.; Koleska, J.V.: Polymer 9(1), 44-7 (1968), C. A. 68, 60003s.
Estimation of T_g of polyethylene by extrapolation of a series of polyethers.

Faucher, J. A., Polymer Letters, 3, 143-5 (1965)
The dependence of glass transition temperatures on mol.wt. for poly(propylene oxide) and poly(butylene oxide)

Faucher, J.A., Koleske, J.V.,C.A. 64, 16652a
Relation between molecular weight and T_g.

Flowers, W. T., et al., C. A. 64, 16006e
Application of mass spec. to the study of fluoropolymer. The copolymer of CF_3NO and CH_2N_2.

Fock, J., J.Polymer Sci., Part B 6(2), 127(1968) C. A. 68(20), 87831x (1968)
The influence of carbon black on the thermal degradations of poly(TFE).

Fox-T.G., Bull.Am.Phys.Soc. [2] 1, 123 (1956). C.A. 51, 11751e (1957)
Influence of diluent and of copolymer composition on the glass temperature of a polymer system.

Frank, W.; Stuart, H.A. Kolloid-Z,Z,Polym. 225(1), 1(1968) C. A. 69(20), 77889d.
Relates changes in shear modulus, and other mechanical properties to isothermal annealing below the glass transition temperature of amorphous polycarbonate, poly (ethyleneterephthalate), and poly(methylmethacrylate).

Fremeera, A.S., C.A. 63, 13433h
Comparison of high elastic properties of inorganic glasses and organic polymers.

Frost, W. M., Advances in Cryogenic Eng. 5, 375(1960)
The strength of 10 structural adhesives at temperatures down to 20°K.

Fujimoto, Katsuya, Nippon Gomu Kyokaishi 34, 532-7(1961)
Resilience of cryst. poly(TFE and CTFE) were detd. in the range -70 to 250°.

Galushko, A.I.: Plast. Massy 1967(8), 67-8 Russ., C. A. 67, 100821v
Measuring polymer glass-transition temperatures by the magnetoelasticity method.

Garfield, L. J. and Petri, S., C. A. 61, 5784d
Viscosity and T_g behavior of polymer-diluent systems.

Garrett, R.R., C.A. 63, 11835g
Penetrometer method for determining T_g.

Gee, G., C. A. 64, 19809c
The thermodynamic analysis of the effect of pressure on the T_g of polystyrene

Gee, G., Proc. Chem. Soc. 1957, 111-18. C. A. 54, 13796f (1960)
The physical properties of polymers in relation to their chemical structure.

Gerenbaum, M.B., Rosenthal, N.A., and Lecher, H.Z., C.A. 59, 10327d (1963)
Polysulfide rubbers having improved low-temperature properties

Gibbs, J.H., and DiMarzio, E.A., J.Chem.Phys. 28, 373-83(1958)
Quant. predictions are made concerning variations of glass temp. with mol. wt., glass temp. with mole fraction of low-mol.-wt. solvent.

Gordon, Manfred, and Taylor, J.S., J.Appl.Chem.2, 493(1952)
Conclude that intermolecular forces are weak for polymers in general, thereby allowing equations relating T_g to copolymer composition to be valid.

Gorelik, B.M., and Bukhina, M.F., Kauchuk i. Rezina 20, No.11, 11-15 (1961). C. A. 57, 3599f (1962)
Crystallization of compressed rubber at low temperatures . An accelerated method for determining crystallizability.

Gosnell, R.B., Advances in Cryogenic Engineering, Vol. 9, Proceedings of the Cryogenic Engineering Conference, U. of Colorado and National Bureau of Standards, Edited by K.D. Timmerhaus, p. 139-145.
Compressibility and sealing properties of laminated composite-fluorocarbon polymer cryogenic gaskets compatible with liquid oxygen.

Grambery, H., et al., C. A. 65, 13874f
Glass-transition behavior of plasticized poly(vinylacetate)

Gray, R.W.; McCrum, N.G. J.Polym.Sci., Part B 6(10), 691(1968) C. A. 70(2), 4744p
Relaxations in linear polyethylene and poly(tetrafluoroethylene).

Greco, G., Leghissa, S., C. A. 64, 8327f
Transitions in high polymers

Grieveson, B.M., Polymer 1, 499(1960). C. A. 55, 9936f (1961)
T_g in homologous series of linear polymers. T_g of methylene found by extrapolation to be -165°.

Griffin, W.R., Rubber World, 136, 687(1957). C. A. 54, 10369a (1960)
Evaluation of 1 F_4, 2 F_4, Kel F 3700, adipate, Fluorel, Viton A, LS-53.

Haldron, R.A.; Schell, W.J.; Simha, R. Transitions in Glasses at Low Temperatures in "Proceedings of the NASA-Case Conference on the Properties of Polymers at Cryogenic Temperatures, Cleveland, Ohio, April 25-27" pp 137-153. Marcel Dekker, 1968.
NASA ref. C06 A69--6493

Hayes, R.A., J.Appl.Polymer Sci. 5, 318(1961)
The relationship between T_g, molar cohesion and polymer structure.

Hatakeyama, Tatsuko; Ogawa, Shigeo Kobunshi Kagaku 25(279), 431-9(1968) C. A 69(24), 97391p
Viscoelastic and thermal behavior of polystyrene near the glass transition temperature.

Heijbaer, J.: Ned.Rubberind, 27(21) 1-2, 4-6, 8, 12-14, 17-20, (22) 1-2,4, 7-10, 12 (1966). (Dutch.)
A lecture on modulus and damping of polymers in relation to their structure. The effect of side-chains on the glass transition temperature is discussed.

Heijbaer, J.: Plastica 19(11), 489-504 (1966) Dnt., C.A. 67, 3357r.
Modulus and damping of polymers in relation to their structure.

Heise, B., H. G. Kilian; and Mueller, F.H.: Kolloid-Z, Z.Polym. 213(1-2) 12-27 (1966) (Ger.), C. A. 66, 38283v, (1967).
Thermally and mech. pretreated, partially crysted. poly (tetrafluoroethylene) samples were studied within the temp. range of crystal structure by X-ray diffraction and differential thermal analysis.

Heise, B.; Kilian, H.G.; Mueller, F.H. Kolloid Z. 213(1-2), 12(1966) English Translation: N68-35526 - National Lending Library for Science and Technology, Boston Spa., England TRANS-1535($50) STAR 6(22), 3896 (1968)
Structural changes in PTFE caused by various types of heat treatment and by cold stretching were investigated.

Heller, J., and Layman, D.J., (Polymer Letters) J.Polymer Sci. Sec. B 1, 317(1963)
T_g by means of differential pressure transducer

Hertz, J., Advances in Cryogenic Eng. 7, 336 (1962)
Epoxy-nylon adhesives for low-temperature applications

Hetemes, E.C., Packard, J.R., Ind. Res., p. 53, Nov. 1965
Behavior of materials at cryogenic temperature

Illers, K.H., Kolloid-Z. 190, 16 (1963)
T_g on 17 copolymers, curves of T_g against composition showed maxima, minimum and both plus and minus deviations.

Illers, K. H., C. A. 64, 17732b
Vitreous solidification and relaxation behavior of amorphous copolymers in the solid state

Jendrychowska-Bonamour, A.M., J.Chim.Phys. 60, (9), 1038 (1963). C. A. 60, 1851b (1964)
Graft of styrene on teflon decreased low temperature deformability in contrast to effect on polystyrene

Jordan, E. F., Jr., et al., J.Pol.Sci. 4 (A-2) 6,975 (1966)
Mechanical properties N-n-alkylacrylamides and acrylonitrile copolymers as related to pendent chain length

Kaimin, I.F., C.A. 66, 2922r
Universal apparatus for investigation of the thermal characteristics of polymers

Kalb, G.H., Coffman, D.D., Fort, T.A., and Johnson, F.L. (du Pont), J.Appl.Polymer Sci. 4, 55(1960). C. A. 55, 3112c (1961)
Polymers from vinyl fluoride. T_m =198° =471°K

Kambara, S., and Hatano, M., Kogyo Kagaku Zasshi 61, 904(1958) C. A. 55, 18696a (1961)
Effect of halogen subst. on m.p. of poly [3,3-bis(halomethyl)-oxacyclobutanes]

Kambour, R. P., Barker, R. E., C.A. 65, 3587e, d
Mechanism of fracture in glassy polymers

Kambour, R. P., C. A 64, 17799c
Mechanism of fracture investigated near Tg for nine glassy polymers.

Kanig, Gerhard: J.Polymer Sci. Part C No. 16, 1957-67 (1967) (Ger.), C.A. 67, 117438y.
Theory of glass temperature of crosslinked polymers. Mathematical relation derived for crosslinked polymers.

Kanig, G., AD-477974
T_g of homopolymers, copolymers and plasticized polymers

Ke, B., Polymer Letters 1, 167(1963)
DTA analyses of high polymers. Some low temperature transitions

Kessenikh, R.M., et al., C.A. 63, 18355f
T_g, T_m, ΔT_g measured for variously plasticized PVC

Keun, Ryum-Sung, Kobunski Kagaku 15, 18-24(1958). C.A. 53, 8699c (1959)
Relation between composition and glass-transition temperature of non-crystalline copolymer

Klason, Carl; Kubat, Josef; and de Ruro, Alf: Rheol. Acta 6(4), 390-6 (1967) Eng., C. A. 68, 13513y.
Optimization of radiometric method for studying Tg in polymer.

Klebanskii, A.L., et al., C. A. 65, 10775d
Structure and T_g correlation of $CF_3CH_2CH_2$ siloxanes

Koenig, J.L.; Serafini, T.T., eds., "Cryogenic Properties of Polymers: Proceedings of the NASA-Case Conference on the Properties of Polymers at Cryogenic Temperatures, Cleveland, Ohio, April 25-27, 1967" 310 pp. Marcel Dekker, New York, 1968.
NASA ref. C18 A 69-16485

Konig, G., and Illers, K.H., C. A. 59, 11675f (1963)
T_g

Koo, George P., Riddell, Malcolm N.; and O'Toole, John L.: C. A. 67, 64818p., Polym. Eng. Sci. 7(3), 182-8 (1967)(Eng.).
Fatigue properties of poly(tetrafluoroethylene) and related fluoro polymers.

Korotaeva, T.B.; Kholler, V.A.; Kozlov, P.V. Vestn.Mosk.Univ. Ser II 23(2), 98(1968) C.A. 69(6), 19665s
The heat of the glass transition in poly(ethylene terephthalate).

Kosfeld, R.: C.A. 67, 22162g. Z. Naturwiss. - Med Grundlagenforsch 1(3), 263-317 (1963) (Ger.).
Physical properties of macromolecules in the solid state.

Kovacs, A.J.: Rheol. Acta 5(4) 262-8 discussion 268-9 (1966) (Eng.), C. A. 66, 38241e.
A correlation of the free volume concept and the Williams-Landel-Ferry eq. (C. A. 48, 13741c) is discussed with 43 references.

Kovacs, A.J., C. A. 61, 5789a (1964)
T_g in amorphous polymers, a review with 184 references.

Krapivina, L.P., et al., C. A. 65, 4037c
Determination of transition temperatures of powdered polymers by the powder thermomechanical method

Krause, S., et al., C. A. 64, 2180c
T_g of 47 different polymers, mostly acrylics

Krause, S., Roman, N., C. A. 62, 16399c
T_g of compatible polymer mixtures (acrylates)

Kryszewski, M.; Mucha, M: J.Polymer Sci.Part B 5(12), 1095(1967) C. A. 68(8), 30544b
The effect of ultraviolet irradiation on the glass transition temperature of modified poly(vinylchloride).

Ku, P.S. (Gen.Elect.,Phila. Missile & Space Div). Report No. 67SD320 1 Jan 68, U.S.G.R.D.R. 69(3), 68(1969) AD 678887
Equations of state of organic high polymers

Kumins, C.A., and Roteman, J., J.Polymer Sci.Sec. A1(1) 527 (1963) C. A. 59, 12935h (1963)
Effect of solid-polymer interaction on transition temperature and diffusion coefficients

Kuroda, Toshihiko, Nagoya Kogyo Gijutsu Shikensho Hokoku 5, 257-61 (1956). C.A 54, 19016c (1960)
Physical properties of fluorocarbon plastics. I. Transition temperature of polytetrafluoroethylene. =330-337°K, 57-63°C

Kuroda, T., and Sakami, H., Nagoya Kogyo Gyutsa Shikensho Hokoku 7, 315-21 (1958). C.A. 57, 13955f (1962)
III. Relation between crystallinity and molecular weight of poly(tetrafluoroethylene)

Lal, J., Scott, K.W., Polymer Previews, 1, (4) 103(1965)
Properties and structure of elastomers

Lal, J. and Trick, G., J.Polymer Sci., Pt.A, 2(10), 4559-72 (1964)
T_g of poly(vinylalkyl sulfides). $CH_3OCH{=}CH_2$, T_g -31; $CH_3SCH{=}CH_2$, T_g -1; $C_8H_{17}CH{=}CH_2$, T_g -80.
$CH_3OCH(CH_3)CH_2$, T_g +67°

Lando, Jerome B.: J.Polym.Sci., Part B 5(10), 971-18 (1967) (Eng.), C.A. 67, 100496t
The melting temperature-composition curves of poly (vinylidene fluoride)-poly(vinyl fluoride) mixtures and vinylidene fluoride-vinyl fluoride copolymers.

Landrock, A. H., C. A. 63, 15043g
Properties of plastics and related materials at cryogenic temperatures.

Lanzavecchia, G. Chim.Ind.(Milan) 50(8), 887(1968)
C. A. 69(22) 87528z
The effect of pressure upon the room temperature transition of PTFE was measured by volume change.

Lazurkin, Yu. S., et al., C. A. 65, 17175d
Mechanical properties of rubber-like polymers in the solid state at low temperatures

Lee, Lieng-Huang J.Appl.Polym.Sci. 12(4), 719(1968)
C. A. 69(2), 3265a
Relationships between surface wettability and glass transition of high polymers.

Lee, W.A., Knight, G.J., U.S.Gov't. R & D Reports., 41 (22) 77 (Nov. 25, 1966) A.D., 483,067 Tech.Rept. TR66005 Jan. 1966
The ratio of Tg to Tm in polymers

Lee, W.A. and Knight, G. J., U.S. Dep. Comm. AD 483067 from U.S. Govt. Res. Dev. Rept. 41(22), 1966., C. A. 66, 95695e.
Ratio of the glass temperature to the melting point in polymers.

Lee, W.A., Sewell, J.H., Tech. Report TR-65112, Royal Aircraft Est., AD 468940, June, 1965
The influence of cohesive forces on the glass transition temperatures of polymers. A linear relationship between Tg and CED below Tg of 25°C

Lee, W.A. and O'Mahony, Deana, Roy. Aircraft Est. Tech.Rpt. 66292, September, 1966, "Calculation of the Glass Temperatures of Polymers Having Alkyl Side-Chains."

Lee, W. A., P. B. 169448 Avail. CFSTI, 77 pp (1965) (Eng.) C. A. 67, 82575m.
Glass transition temperatures of homopolymers: a bibliography and assessment of available data.

Lee, W.A. and Diana O'Mahony. Gt. Brit.Roy.Aircraft Estab. Tech.Rep. No. 66292, C.A. 68, 115086d.
Calculations of the glass temperatures of polymers having alkyl side chains.

Lee, W.A.; Sewell, J.H., J.Appl.Polym.Sci. 12(6), 1397 (1968). C. A. 69(8), 28002a
Influence of cohesive energy and cohesive energy density upon Tg.

Leshchenko, S.S., Karpov. V.L., and Kargin, V.A., C. A. 59, 8937 (1963)
Electrographic study of fluorine-containing copolymers of CF_2CH_2 with C_3F_6 and CF_2CFCl

Lewis, O.G., Gallacher, L.V., Tech. Report AFML-TR-65-231 July 1965 AD 620734
Mathematical treatment of polymer T_g

Lewis, O. G., Gallacher, L.V., C. A 64, 8330e
The relation between polymers and glass transition temperatures

Licht, W.R., Kline, D. E., C.A. 65, 3991d
Specific volume studies of γ-irradiated poly(tetrafluoroethylene)

Lipatov, Yu. S., Geller, T.E., C.A. 65, 814e
Applicability of the free-volume concept to the glass-transition in polymers on the boundary with a solid surface.

Litt, M.H. and Koch, P.: J.Polym.Sci. Part B 5(3), 251-6 (1967) (Eng.), C.A. 66, 105304t.
Cold flow of glassy polymers. I. Effect of internal stress.

Lohr, J. J., C.A. 63, 18281b
Yield stress master curves for various polymers below their Tg.

Lorant, M., C.A. 61, 735g (1964)
Apparatus for determining T_g. Low temperature gases used in a dilatometer.

Ludtke, P.R., and Weitzel, D.H., Advances in Cryogenic Eng.8, 467-77 (1962). C.A. 59, 12-98e (1963)
Force and seal evaluation of elastomeric O-rings. O-ring cooled to 76°K; force-temperature curves (for beginning of leaks) recorded; no change in curves at T_g.

Madorsky, S.L., Hart, V.E., Strauss, S., and Sedlak, V.A., J.Res. NBS 51, 327 (1953)
Thermal degradation of $(CF_2CF_2)_n$, $(CF_2CHF)_n$, $(CF_2CH_2)_n$, $(CFHCH_2)_n$

Magill, J.H., et al., C. A. 64, 8327h
T_g and crystal modification of linear polymethylene

Malichenko, B.F.; Shelud'ko, E.V., Vysokomol.Soedin., Ser.B. 10(6), 395(1968). C. A. 69(14), 52540v.
Thermal stability of polyurethanes improved by use of fluorine-containing monomers: $H_2NCH_2(CF_2)_4CH_2NH_2$ + $Cl\overset{O}{\overset{\|}{C}}O(CH_2)_6O\overset{O}{\overset{\|}{C}}Cl$ ⟶ polyurethane.

Manaresi, P. et al C. A. 61, 12102h (1964)
Determination of transition temperature through measurement of dilation, DTA, X-ray diffraction and beta-ray absorption

Mandelkern, L., Martin, G.M., and Quinn, F.A., Jr., J.Research Nat'l Bureau Standards 58, 137 (1957)
T_g for $(CF_2CFCl)_n$, $(CF_2CH_2)_n$ and copolymers

Marei, A.I., C. A. 54, 23395f (1960)
The effect of functional groups on the glass transition temperature of rubber-like polymers

Martin, G.M.; Eby, R.K., J.Res.Nat.Bur.Stand.,Sec.A. 72 (5), 467 (1968) C. A. 69 (26), 107193s
Effects of low pressure on the room temperature transitions of poly(tetrafluoroethylene).

Martin, G.M., and Mandelkern, L., J.Research Nat'l. Bur. Standards 62 141-6 (1959). C.A. 53, 16574a (1959)
T_g increases from -69° to +90° in vulcanizates as amount of bound S is increased

Martin-Marietta Corp. "Cryogenic Material Data Handbook, Second Edition, 1964"

Maurer, J.J., C. A. 64, 11421e
Relation between T_g and composition in ethylene-propylene copolymers

Mawers, R. E., Advances in Cryogenic Eng. 6, 627 (1961). C. A. 55,20484b (1961)
Simple hardness test to determine relative crystallinity of fluorinated plastics is correlated with mechanical properties at cryogenic temperatures.

McCall, D. W., C. A. 64, 16008f
The interpretation of secondary transitions in polymers.

McCrum, N.G., J.Pol.Sci., 34, 355(1959)
T_g by dynamic method

McCrum, N.G., J.Polymer Sci., Pt A, 2(9), 3951-8 (1964); C. A. 61, 13440h.
Energy of low-temperature relaxation of PTFE.

McCrum, N.G., C. A. 54, 2885c (1960)
Internal friction in copolymers of C_2F_4 and C_3F_6

Mercier, J.P., Ind. Chim. Belge., 30, 813(1965)
Physics and transitions in high polymers

Miller, A.A.: Pol. Previews 3(8), 433(1967).
A kinetic interpretation of the glass transition: glass temperature of n-alkane liquids and polyethylene.

Miller, A.A., C. A. 60, 14622a
T_g polystyrene and polyisobutylene

Miller, A.A., J.Chem.Phys 49(3), 1393(1968) C. A. 69(22), 88557h
Polymer-melt viscosity and the glass-transition: an evaluation of the Adam-Gibbs and the free-volume models. Applied to polymethylene.

Miller, A.A., J.Polymer Sci., Part A-2 6(1), 249(1968)
C. A. 68(20), 87674y (1968)
Kinetic Interpretation of the glass transition: T_g of n-alkane liquids and polyethylene

Miller, A.A. J.Polymer.Sci.Part A-2 6(6), 1161 (1968)
C. A. 69(2), 3234q
Analysis of the melt viscosity and T_g of polystyrene

Miller, A.A., Gen.Elect.Schenectady N.Y., Rept. 67-C-091
A kinetic interpretation of the glass transition-glass temperatures of n-alkane liquids and polyethylene. C18 N68-24504

Miller, R.N., et al., I and E.C., Product R. and D., 1, 257(1962)
Properties of foams, adhesives and plastic films at cryogenic temp.

Mishcheuko, M.I., et al., C. A. 64, 19886b
Thermophysical properties of polymers over a wide range of temperatures.

Moacanin, J., Simha, R., C. A. 65, 9745h
Some consequences of the Gibbs-DiMarzio theory of the glass transition.

Mohammed, Abu Naser (Texas A & M Univ.) Univ. Microfilms Order No. 67-4713 S.T.A.R. 6(13), 2087(1968) Report Nr. N68-23264
The rheology of polymers.

Molho, R.; Soffer, L.M., Mechanical Properties of Epoxy Resins and Glass/epoxy Composites at Cryogenic Temperatures in "Cryogenic Properties of Polymers: Proceedings of the NASA-Case Conference on the Properties of Polymers at Cryogenic Temperatures, Cleveland, Ohio, April 25-27, 1967 pp 87-117; Marcell Dekker New York. 1968

"Montecatini", Italian 611,443. C. A. 57, 15315d (1962)
Copolymers of C_2H_4 and C_3H_6 and C_2H_4 and 1-butene with T_g of -40 and with brittle temperature of -95°

Muus, L.T., McCrum, N.G., and McGrew, F.C., SPE J. 15, 368 (1959)
Properties below T_g

Myagchenkov, V.A., Gibadullin, L.A., C. A. 65, 7301a
Thermomechanical study of a series of copolymers of methyl methacrylate

Nakajuna, T., and Sailo, S., J.Polymer Sci. 31, 764(1958). C. A. 53, 764a (1959)
$(CF_2=CFCl)_n$ T_g extends from -80 to 60 by dielectric prep. measurement.

Nanda, V. S., et al., C.A. 65, 2362b
Principle of corresponding states and equation of state of polymer liquids and glasses. Some thermal properties of Teflon.

Newman, S., Strella, S., C.A. 63, 3117d
Stress-strain behavior of rubber-reinforced glassy polymers

Nielson, L.E., Reo. Sci. Inst., 22, 69(1951)
T_g measurement of torsion pendulum

Nielson, L.E., SPE Journal 16, No. 5,525-33 (1960). C.A. 54, 1475d (1960)
Dynamic mechanical properties of high polymers

Nielson, L., J.Appl.Sci. 8, 511-20(1964) C.A. 60, 10900a
Tightly cross-linked rubbers show slight increase in T.

Nishizaki, Shunichiro; Eto,Shohei; Moriwaki, Toshimato. Kogyo Kagaku Zasshi, 71(2), 265(1968) C.A. 68, 115088f
The melting temperatures and the glass-transition temperatures of polyesters containing the 4,4'-oxydiphenylene group were determined by DSC.

Novikov, A.S., and Galil-Ogly, F.A., C. A. 53, 13644c (1959)
Heat, Oil, and freezing stability of elastomers

Novikov, A. S. et al., C. A. 57, 12678i (1962)
Structural transformations of fluorine-containing elastomers in thermal treatment

Peckner, D., and Riley, M.W., Materials in Design Eng. 54, No.1, 107(1961). C. A. 55, 19349c (1961)
The role of materials in cryogenics

Perepechko, I. I. and Bodrova, L.A.: Plast. Massy 1967 (7), 56-8 (Russ.), C.A. 68, 13512x.
Determination of transition temperature in polymers by an acoustic method.

Perepechko, I.I.; Bodrova, L.A. Vysokomol. Soedin. 'Ser.B. 10(3), 148(1968) C. A. 69(2), 3226p
Anomalous viscoelastic behavior of poly CTFE in the low temperature region. Young's modulus below T_g dependent upon degree of crystallinity.

Perepelkin, A.N., Koglor, P.V., C.A. 64, 12819g
Effect of chemical structure on T_g of polycarbonates

Peschanskaya, N.N., et al., C.A. 64, 3708a
Durability and deformation of polymers at low temperature

Pezzin, G., Ajroldi, G.; and Garbuglio, C.: C.A. 68, 50464d., J.Appl.Polym. Sci. 11(12), 2553-66 (1967) (Eng.).
Dynamic-mechanical study of the secondary transition of poly(vinyl chloride).

Pistorius, C., Polymer 5(6), 315-17 (1964) C. A. 61, 7181d (1964) $-(CF_2CF_2)_n-$ transitions

Pittman, A.G.: Vortex, 29(2), 52-6, 58-9 (1968), C.A. 68, 59995k
Significant surface properties of new fluoropolymers. Study of surface energy relative to fabric coatings.

Pittman, D.G., Sharp, D. L., Pol. Let. 3, 379-81(1965)
T_g of $-(-CH(CH_2OCF(CF_3)_2)-CH_2O-)-$ is reported as -43°

Polmanteer, K.-E., et al., Rubber Chem. & Tech. 39, (5), 1403 (1966)
Shift in Tg by elastomer orientation

Polmanteer, K.E., and Hunter, M.J., J.Appl.Polymer Sci. 1, 3-10 (1959). C.A. 53, 20877b (1959)
Polymer comp. vs. low-temp. prop. of polysiloxanes. Small amts of ϕMeSiO increase low temp. flex. dramatically

Porter, Harold J. and Kulkarni, R.K., U.S. Dept. Comm. AD 633041 from U. S. Govt. Res. Dev. Rept. 41(13), 78 (1966) C. A. 66, 95494p.
Glass-transition temperatures of poly(alkyl α-cyanoacrylates).

Powell, E., Elgood, B.G., C.A. 65, 3980h
Glass transitions in vinylidene chloride copolymers

Prevorsek, D., C.A. 64, 16045f
Tensile strength of orientated polymers below Tg

Radushkenich, B.V., et al., C.A. 64, 3752g
Melt viscosity of fluorine-containing polymers

Raphael, T. and Armeniades, C.D., C.A. 60, 16054a (1964)
ADL Boll rebound tests on plastics from -200 to 500°F.

Reding, F.F., Faucher, J.A., and Whitman, R.D., J.Polym.Sci. 57, 483 (1962). C. A. 57, 2399c (1962)
Glass transitions in ethylene copolymers

Reevers, R.B., C.A. 51, 9262f (1957)
Mechanical properties of polymers in the glass transition region.

Reick, L., C.A. 65, 3966e
Estimation of activation energy from DTA and TGA traces

Robb, L.E., and Wolf, D.R., (to 3M), U.S. 2,849,412. C.A. 53, 756b (1959)
Plasticizers to improve low-temp. prop. of polyperfluoro-chloro-olefins are esters of formula ROX(OR)

Robbins, R.F.; Reed, R.P.; Adv.Cryogenic Eng.: Proc. 1967 Cryogenic Eng. Conf., Stanford, Calif 21-23 Aug. 1967 13, 252-258 USGRDR 69(5) 99(1969), PB 180, 896
Tensile properties of neoprene below T_g, compared with properties at ambient temperature.

Robbins, R.R., Oboni, Y., and Weitzel, D.H., Advances in Cryogenic Eng. 8, 287-99 (1963). C.A. 59, 10323a (1963)
Linear Thermal expansion of elastomers in the range 300° to 76°K

Robbins, B.F., Weitzel, D.H., and Herring, R.N., Advances in Cryogenic Eng. 7, 343 (1962)
The application and behavior of elastomers at cryogenic temperature.

Robertson, R.E., C.A. 65, 2367c
Theory for the plasticity of glassy polymers

Roctling, J.H., C. A. 64, 6776
Yield stress behavior of poly(ethyl methacrylate) in the glass transition region

Rogers, S.S., and Mandelkern, L., J.Phys.Chem. 61, 985-90 (1957) C. A. 52, 31e (1958)
T_g of these polymers decreased as No. of carbon atoms in side chain increased. Change in T_g explained by variation in sp. vol.

Roseland, L.M., C. A. 65, 11789e
Discussion of methods of improving cryogenic properties of structural adhesives.

Rothstein, E.C., Spechler, D., C.A. 64, 19886f
Rapid determination of thermal expansion and apparent second order transition temperature of polymer films

Royal Aircraft Establishment (Lib.Trans. No. 1206), Qi Zong-Neng, Huaxue Tongboo No. 5 1-8 (1965).
The relationship between the chemical structure of high polymers and the glass transition temperature.

Ruby, J.D., NASA, Doc. N63-19809 (1963). C. A. 60, 9456g (1963)
Elastomers for potential use at cryogenic temperatures.

Saba, R.G., et al., J.Polymer Sci., PtA, 1, 1483(1963)
Low temperature transitions in

CH_3CHCH_2O, $(CH_3CH_2OCH{=}CH_2)_n$ has loss maximum at -170

Sakurada, Ichiro; Taisuke, Ito; Katsukiko, Nakamae; J.Polym.Sci., Part C 1967(15), 75-90, C. A. 66, 65956y
Elastic moduli of the crystal lattices of polymers.

Sakurada, Ichiro; Katsukiko, Nakomae; Keisuke, Kaji; and Wadano, Susumu: Iobunski Kagaku, 23, 335-37 (1966) Japan, C. A. 66, 46723d (1967)
Experimental determination of elastic moduli of the crystalline regions in oriented polymers. V. Poly (tetrafluoroethylene).

- Satokowa, T., and Koisumi, S., Kogyo Kagaku Zasshi 65, 1211(1962) C. A. 58, 1544h (1963)
Transition at 130° in poly(tetrafluoroethylene)

Satokowa, T., and Koisumi, S., Kogyo Kagaku Zasshi 65, 1211 (1962) C. A. 58, 1544h (1963)
Transition at 130° in poly(tetrafluoroethylene)

Sazhin, B.I., et al., C. A. 64, 3767
Dielectric properties of poly(propylene oxide)

Sazhin, B.J., Eidel'naut, M.P., C.A. 64, 19886a
Electroconductivity of polymers and orientation effects.

Schreger, G., C.A. 63, 11785h
Effect of plasticizers on T_g

Sedlak, John A.; Matsuda, Ken (American Cyanamid Co.) U.S. 3,397,180(Cl. 260-63) C.A. 69 (18), 67930W
1-Fluorovinyl methyl ketone and its polymers and copolymers. Homopolymer shows T_g +145°.

Scatena, M.; Sanmartin, P.; Zilio-Grandi, F., Fed.Assoc.Tech. Ind. Peintures, Vernis, Emaux.Encres Imprimeria Eur.Continentale Congr. 1968, 9, 3:68-3:73. C. A. 69 (18), 67966n
The differential scanning calorimeter used in T_g measurements of polymers. Influence of additives on T_g of poly(vinyl acetate).

Sheldon, R.P., J.Appl.Poly.Sci. 6, 543(1962)
Simple method for determination of glass temperature of amorphous polymers using polarizing microscope

Shen, Mitchel C. and Eisenberg, Adi, U.S. Dept. Comm. AD 469073, From U.S. Govt. Res. Dev., Rept. 41(15), 75(1966), C.A. 66, 95395g (1967).
The phenomenology of the glass transition in polymers.

Shen, M.C., Tobolsky, A.V., C. A 63, 11786e
Effect of plasticizer, chain ends and comonomer on T_g. Mathematical treatment

Shen, M.C. and Tobolsky, A.V., U.S.Gov.Research Reports AD-434 299
Effect of plasticizer, chain ends and comonomer on the T_g of polymers

Shetter, J.A., J.Polymer Sci., PtB, 1, 209(1963)
Effect of stereoregularity on T_g in polyacrylates and polymethacrylates

Shintani, R., et al., C.A. 65, 10731d
Tg data by volumetric dilatometry of epoxy, phenolic and polyesters

Shroff, Ramesh Naginlal, Univ.Microfilms (Ann Arbor, Mich.) Order No. 66-11, 836, 179 pp.; Diss. Abstr. B 27(5), 1450 (1966) Eng., C. A. 66, 65946v.
Glass transitions and frequency dispersions in polymers undergoing shear.

Sibilia, J., Paterson, A., C.A. 63, 1887b
Mechanism of CTFE polymer thermal degradation

Simha, R., and Boyer, R.F., J.Chem.Phys. 37, 1003-7(1962) C. A. 57, 15328g (1962)
General relation involving the glass temperature and coefficients of expansion of polymers

Slonimskii, G.L.; Askadskii, A.A.; and Pavlov, V.I., Vysokomol. Soedin., Ser. A 9(2), 365-9 (1967) (Russ.), C.A. 66, 116177e.
Effect of supermolecular structure type and chemical composition on strength and elasticity of polymer glasses.

Smit, P.P.A. Rubber Chem. Technol. 41(5), 1194 (1968)
The effect of carbon black upon T_g of rubber is explained in terms of adsorption of rubber on the black surface.

Smith, M.B., and Susman, S.E., Advances in Cryogenic Eng. 8, 300 (1962)
Development of adhesives for very low temperature application

Sobolevskoya, et al., C. A. 59, 11674d (1963)
Synthesis of poly(methylsiloxanes) with improved low-temperature properties. Inclusion of methyl(trimethylsilyloxy)-silyl units reduced solidification point from -76° to -118°

Solomko, V.P. and Semko, L.S.: Khim.Prom.Ukr. (Russ.) 1966(5) 11-14 (Russ.), C. A. 66, 95490j
Effect of glass fibers on glass-transition temperature of polystyrene and poly(methyl methacrylate).

Solomko, V.P., Uskov, I.A., C.A. 65, 863g
Thermomechanical studies of filled polymers.

Somcynsky, T., and Patterson, D., J.Polymer Sci. 62(174) S151-S155(1962)
The glass transition and the reduced temperature of polymeric liquids. Theory of corresponding states tested by lowering of T_g for a polymer by solvents from the n-alkanes homologous series.

Stapler, John T.; Barnes, Wm.J.; Yelland, Wm.C. Army Natick Labs, Report Nr. C/OM-50 U.S.A.-NLABS-TR-69-7-CM U.S.Govt.Res.Dev. Repts, 68(18), 82(1968) AD 672509 NASA-STAR N68-34374
Thermal Degradation of Poly(vinylidene fluoride) and poly(vinylfluoride) by Oven Pyrolysis.

Stauerman, A.J.: C.A. 67, 22644y., Kolloid-Z. Z. Polym. 216/217 (March-April), 81-85 (1967) (Ger.).
Relations between thermodynamic and mechanical values in (rubbery) polymers.

Steere, R. C., C.A. 66, 2920a
Detection of polymer transitions by measurement of thermal properties. 1st and 2nd transition for poly(TFE)

Stevens, J.R., and Ivey, D.G., J.Appl.Phys. 29, 1390-4 (1958) C. A. 53 817g (1959)
Mechanical behavior of a polymer at temperatures through the glass transition temperature.

Stratta, J., Reding F. and Faucher, J., C.A. 62, 6578h
T_g of $(CH_2CH_2CH_2\text{-}O)_n$ -64°, A mechanical loss peak at -128° was attributed to 3 methylene groups in sequence.

Strella, S., J.Polymer Sci. Pt.B, 2(6) 625-6 (1964)
C. A. 61, 5789c
DTA of polymers undergoing T_g.

Swenson, A., Rev.Sci.Instr. 25, 834-5 (1954)
Mechanical properties of teflon at low temperatures

Tautz, H., et al., C. A. 61, et al, 735d (1964)
Specific heats of polymers between -150 and 180°. Low pressure PE, T_g 130-3 high pressure PE, T_g 111-4.

Taylor, G.L.; Davison, S., J.Polym.Sci., Part B 6(10), 699(1968); C.A. 70(2), 4734k (1969)
T_g of hydrogenated polystyrene: T_g of poly(vinylcyclohexane) was ca 20° higher than the polystyrene from which prepared.

Tautz, H., et al., C.A. 61 et al, 735d (1964)
Specific heats of polymers between -150 and 180°. Low pressure PE, T_g 130-3 high pressure PE, T_g 111-4.

Temin, S. C., C. A. 62, 9300a
Effect of structure on T_g of polyamides

Thompson, E.V., C. A. 64, 17728d
Dependence of Tg of poly(methyl methacrylate) on tacticity and molecular weight.

Thrower, J. and White, Mary A. (Royal Air.Est., Farnborough, England), Fluoroaromatic Polymers, Perfluoro-meta-polyphenylenes (RAE-TR-66031).
Properties of model compounds and polymers described include general physical characteristics as well as thermal and thermal oxidative stability.

Tobolsky, A.V., and Takohoshi, M., J.Polymer Sci. Pt A, 1, 483(1963)
Rheology of teflon. T_g=110° by relaxation time-temperature measurements.

Tobolsky, A.V. NASA, Doc. N63-13205(1963). C. A. 60, 1854d (1964)
Aspects of viscoelasticity of polymers

Tobolsky, A.V., Scientific American, 197, No. 3, p 121 (1957)
The mechanical properties of polymers.

Turley, S.G. and Keskkula, Henno: C. A. 68, 5-232b., J.Polym.Sci., Part C No. 14, 69-87 (1966) (Eng.).
A survey of multiple transitions by dynamic mechanical methods.

Ueberreiter, K., C. A.63, 11790h
The elastic range of polymers and its change by plasticization.

Uematsu, Y., C. A. 62, 14842a
T_g higher with ester or ether bonds in main chain, whereas side Me group lowers T_g.

Ueberreiter, K., Bruns, W., C.A. 64, 9834c
Thermodynamics of polymer solutions, Nature of the glass transition.

Vocrodskaya, M.V. and Bartener, G.M.; C.A. 61, 803g (1964)
Fillers to a 20% loading doesn't change T_g.

WADC Tech. Report 52-197, Part VII, Oct. 1957 (3M)
Tg's of fluorine-containing esters and ethers

Waldrow, C. R., et al., C. A. 64, 19007e
Testing for mechanical properties of materials in liquid H_2.

Wall, L.A., and Straus, S., J.Research NBS 65-A, 227 (1961)
C. A. 55, 19428f (1961)
Pyrolysis of fluorocarbon polymers. $(CF_2CF_2)_n$, $(C_3F_6)_n$, and $(CF_2CFCl)_n$

Watanabe, K., Nippon Gomu Kyokaishi, 33, 882 (1960). C.A. 55, 22888h (1961)
Stress relaxation and creep for several elastomers....results serve as criteria of usefulness of the elastomers at any temp.

Weitzel, D. H., Robbins, R.F., Tech. Report ML-TDK-65-50, Pt. III
Elastomeric seals and materials at cryogenic temperatures

Weitzel, D.H., et al., Advances in Cryogenic Eng., 6, 219(1961)
C. A. 55, 25316f (1961)
Elastomers for static seals at cryogenic temperatures.

Willbourn, A.H., Trans. Faraday Soc.54, 717-29(1958). C.A. 53, 1894f (1959)
Glass transition in polymers with the $(CH_2)_n$ group.

Wiles, R. J. (WRE-TN-CPD-113) NASA Report No. N68-17312, S.T.A.R. 6(18), 1189 (1967).
The effect of filler content on the glass transition temperature and glassy modulus of a polyurethane rubber.

Wood, Lawrence A. and Bekkedahl, Norman: J.Polym.Sci., Part B 5(2), 169-75 (1967) Eng., C. A. 66, 94990x.
The increase in sp. heats of elastomers above the glass transition temperature is discussed.

Wood, L.A., J.Polymer Sci. 28, 319-30(1958). C. A. 52, 15110i (1958)
Equation relating T_g of a copolymer to T_g of each of the homopolymers

Wood, L. H., J.Pol.Sci., 28, 319-30(1950)
T_g of copolymers

Woodward, A.E., Polymer Previews, 2(4), 106(1966)
Mechanical loss mechanism for polymers at very low temp.

Woodward, A.E., and Sauer, J.A., J.Appl. Polymer Sci. 2, 114-58 (1959). C. A. 54, 10385c (1960).
Dynamic mechanical properties of high polymers at low temp.

Wunderlich, B.W. and Bodily, D.M. C. A. 61, 7115f
T_g by DTA

Wymann, Donald P.: J.Appl.Polym.Sci., 11(8), 1439-48 (1967) (Eng.), C. A. 67, 91184k.
Method for separating intramolecular and intermolecular interactions which influence polymer glass temperatures.

Yoshida, T., et al., J.Pol. Sci., Pt. A, 3(5), 1685(1965)
Stress relaxation of γ-irradiated fluorocarbon polymers

Zakharenko, N.V. and Gaurilina, R.A.: Kauch. Rezina 26(11), 47-9 (1966) (Russ.), C. A. 66, 46681p, 1967.
Comparison of various methods for determining the glass temperature of polymers.

Zannetti, R. Manaresi, P., and Balli, L., Rubber Chem.Technol. 36, (2) 459 (1963).
Determination of phase changes by beta-ray absorption.

VI. Polymerization Systems

Allied Chem. Corp. (Robert Fuhrman, David Jerolamon), U.S. 3,304,293 (Cl. 260-92.1), February 14, 1967, C.A. 66, 86128.
Gas Phase polymerization of tetrafluoroethylene, silica gel catalyst.

Asahi Chem. Ind., Ltd., Japan, 11,624(1965). C. A. 64, 5226f
R_5PAlX_3 X=halogen or TiX_3 olefin polymerization catalyst

Bamford, C.H., Finch, C.A. (to Courtalds, Ltd.) Brit. 1,033,161, C.A. 65, 9048e
Vinyl polymerization process

3M, Brit. 856,469. C. A. 55, 14990f (1961)
Fluorine-containing vinyl compounds with Ziegler catalysts. CF_2CFCl; 1,1,3-trifluorobutadiene; 1,1-difluorobutadiene, CH_2CF_2

Bro, M.I., Convery, R.J., and Schreyer, R.C., U.S. 2,988,542. C. A. 55, 22917a (1961)
Fluorine-containing 1-olefins polymerized in a halogenated solvent with R_fCOOH

Brown, Daniel A.; Wall, Leo A.: J.Polymer Sci. PtA-1 6, 1367 (1968 USGRDR 68(21), 80(1968) AD 674 072
Radiation-induced copolymerization of tetrafluoroethylene and 3,3,3-trifluoropropene under pressure.

Brown, D.W., Wall, L.A., C.A. 64, 12806c
Radiation induced polymerization at high pressure in solid and fluid phases

Bruk, M. A., et al., C. A. 65. 5540e
Radiation induced polymerization of C_2F_4 and acrylonitrile. Kinetics of gamma-radiation polymerization of C_2F_4 at 4.2°K

Bulygina, L. A. and Volkova, E.V.: Radials.Khim.Polim.Mater. Simp., Moscow 1964, 122-6, (Rub.1966) (Russ.)., C.A. 66, 95567q.
Radiation polymerization of vinyl fluoride and vinylidene fluoride.

C.A. 65, 17083a,b,d,f
Polymerization of formaldehyde. Various systems for polymerization of pure H_2CO

Chisso Corp. Japan 16,149(1965). C.A. 64, 5227a
$RAlX_2$ + $TiCl_3$ or $3TiCl_3 \cdot AlCl_3$ olefin polymerization catalyst

Chiklis, C.K.; Haas, H.C.: J.Polym.Sci., Pt.A-1 6(9), 2573(1968) C.A. 69(20), 77811x
The polymerization of 2,2,2-trifluoroethyl vinyl ether was studied with six different catalyst systems, including BF_3, BF_3 .Et_2O, CrO_3, EtMgBr, Ziegler-type, $Al(HSO_4).7H_2O$.

Colombo, P., et al., J.Pol.Sci., Pt. A-1(4) 29 (1966)
Copolymerization of CO with C_2H_4

Colombo, D., Steinberg, M., and Macehia, D., J.Polymer Sci. Part B 1, (9), 483-8 (1963). C. A. 59, 14116d (1963)
Co^{60} gamma-ray induced copolymerization of ethylene in presence of other monomers.

Coover, H.W., Shearer, N.H., U.S. 3,220,-97. C. A. 64, 5226e
Olefin polymerization catalyst

Coover, H.W., Joyner, F.B., U.S. 3,213,073. C.A. 64, 5227d
Olefin polymerization catalysts

Coover, H.W., U.S. 3,222,337. C. A. 64, 5227c
$RAlX_2$ as olefin polymerization catalyst

Coover, H.W., Joyner, F.B., U.S. 3,222,344. C. A. 64, 5226h
Olefin polymerization catalysts

Crawford, G.H., U.S. 3,089,866. C. A. 59, 1776h (1963)
Ziegler polymerization of fluoroolefins.

Daikin Kogyo Co., Ltd., Japan 10,989(1965). C.A. 64, 12838b
Polyhexafluoropropylene made with glow discharge

Daikin Kogyo Co., Ltd., Japan 10,991 (1965). C. A. 64, 12838c
CF_2X_2 or CF_2XCF_2X polymerized in a glow tube

Daikin Kogyo Co., Ltd., Fr. 1,394,585. C. A. 64, 8342f
Polymerization of fluoroolefins by ionizing radiation

Neth. Appl, 6,500,955 (to Diamond Alkali). C. A. 64, 3725h
Polymerization of CH_2=CHF .

Dorfman, E., et al., C. A. 66, 11585h
A synthesis of poly(2,4-perfluoroalkylene-6-perfluoro-alkyltriazines). Triazines prepared by cyclodehydration of perfluorobutyric anhydride and imidoylamidines

Neth. Appl. 6,502,852(to duPont). C. A. 64, 8339a
Polymerization with Xe fluoride initiators

duPont, Neth. Appl. 6,510,472, C. A. 65, 3993g
Polymerization in aqueous emulsion of water-insoluble monomers of high molecular weight.

duPont, Neth.Appl. 6,515,896, C. A. 65, 17081g
Polymerization of perfluoroalkenes. C_2F_4 or C_3F_6 polymerized in aqueous emulsion.

Duck, E.W., Brit. 853,355. C. A. 55, 10969f (1961)
Ziegler polymerization of perfluoroolefins

Elkins, V. V., Jr., U.S. 3,206,344 (to duPont). C.A. 63, 18406a
Bonding fluorine-containing copolymers to metal

Fearn, J.E., Wall, L.H., C.A. 63, 18272a
Preparation and polymerization of some perfluorodienes

Florin, R.E., and Wall, L.A., J.Research NBS 65-A, 375 (1961)
Gamma irradiation of fluorine-containing polymers

$$CF_2CFH \xrightarrow[60\text{-}80^\circ]{\text{persulfate}} [CF_2CFH]_n$$

A. Gantnikher, et al., C. A. 61, 10786e (1964)
Gamma irradiation of C_2F_4 at -55°. Rate of polymerization $> C_2H_4$ explained by lower rate of chain rupture.

Ham, G.E., Pol. Let. 3, 185-188 (1965)
Copolymerization of CO with C_2H_4

Hayashi, K., Williams, F., C & E News, 44 (21), 49 (1966)
In many radiation induced polymerizations trace amounts of H_2O retard rate.

Helfrich, G.F., and E.J.Rothermel, Jr. (to Dow Chemical)
U.S. 3,380,977 (Cl. 260-87.5). C. A. 68, 115212s
Fluorinated polymers from F-contg vinyl monomers initiated by $TiCl_4$, ET_3Al and THF.

Iserson, H. (to Pennsalt) U. S. 3,245,971, C. A. 64 19822a
Catalysts for polymerization of vinylidene fluoride.

Israel Mining Industries, Institute for Res. & Dev. Brit. 1,120,152 (Cl. C 08f), C. A. 69(14), 52643f
Describes polymerization of allyl fluoride with azobisisobutyronitrile initiator.

Kern, R.J. (to Monsanto) U. S. 3,252,953, C. A. 65,5627b.
Polymerization of vinyl ethers

Ketley, A.D., U. S. 3,193,541. C. A. 63, 8518d
Polymerization of vinyl isobutyl ether with $BF_3.Et_2O$

Khramchenkov, V.A., C. A. 59, 4039c (1963)
Radiation-induced polymerization of fluoroolefins. $CF_3CF=CH_2$ $CF_3CH=CF_2$, $CF_3CF=CHF$, CF_3CHCF_2, $CH_2C(CF_3)_2$

Khramchenkov, V.A.; Proc.Tihany Symp.Radiat. Chem.Znd., Tihany, Hung. 1966, 443-7; C. A. 68(8), 30543a
Radiolytic formation of polymers from mixtures of hexafluorobenzene with perfluorocyclohexane and perfluorononane.

Korshok, V. A., et al., C. A. 63, 18364g
Modification of properties of fluoropolymers

Kureka Chemical Industry Co., Ltd., Fr. 1,419,741, C. A. 65, 9049b
Fluoroethylene polymerized by dialkyl percarbonates

Lowry, R. E., et al., C. A. 65, 13839c
Radiation induced polymerization of hexafluoropropylene at high temperature and pressure.

Machi, Sueo, et al., J.Pol.Sci., Pt. A(3) 2931(1965)
Gamma initiation of C_2H_4

Manno, P.J., Nucleonics 22(2), 49(1964) ibid. 22 (6), 64(1964)
Radiation polymerization of fluoromonomers. Polymerization rate and yield increases with temp.

Mantell, R.M. and Hoyt, J.M., (to 3M), U.S. 3,043,823. C.A. 57, 12719b (1962)
Emulsion polymerization of fluorinated monoolefins. Standard system, except that 5 pts/150 of CS_2 added.

Marsel, C. J., Prince, M., C. A. 62, 11913a
High pressure polymerization

Montecatini Edison S. P. A., C.A. 67, 44294m, Neth. Appl. 6,613,478 (Cl. C. 08f), April 5, 1967
Fluorine-containing polymers.

Morton, Maurice (Akron Univ., Ohio. Inst. of Rubber Research) Low Temperature Polymerization Studies Progress Report, Apr. 1 - June 30, 1965, Contract AF 04(611)-9694, PR-6; AD 618228.
Exploratory polymerizations or attempted polymerizations of tetracyanoethylene, perfluorobutene-2, hexafluoropropylene, vinyl triethoxysilane, p-nitrostyrene, and benzaldehyde were conducted.

Morton, Maurice (Akron Univ., Ohio Inst. of Rubber Research) Low temperature Polymerization Studies Progress Report. Jul. 1 - 30 Sept. 1965, Contract AF 04(611)-9694.
Polymerization of the fluorovinyl monomers is probably caused by the high energy radical cation formed as a result of primary radiolysis.

Mulvaney, J.E., Markham, R. E., C. A. 65, 812c
Anionic initiation of vinyl polymerization by dimsylsodium in aprotic solvents.
Dimsylsodium = CH_3SOCH_2Na

Neth. Appl. 6,408,152. C. A. 64, 511e
Poly(1-octene)

Plyusnin, A.N., Chirkov, N.M., C. A. 65, 9025d
Anomalous dependence of the polymerization of TFE on initiator concentration.

Plyusnin, A. N.; Chirkov, N.M. Vysokomol Soedin, Ser.A. 10(5), 1058(1968) C. A. 69(8), 27855u
Kinetics of TFE polymerization in aqueous persulfate solutions.

Ponomarenko, V.A.; Khomutova, N.M. USSR patent 219,194 (Cl. C 08f). C. A. 69(22), 87583p
High molecular weight fluorine-containing polyethers prepared by cationic polymerization of F-contg epoxides.

Relyea, Douglas, I.; Smith, Homer P.; and Johnson, Arnold N. (U.S. Rubber Co., Wayne, N.J.), Polymerization Studies Leading to High Strength Chemical Resistant Elastomers Serviceable at Temperature Extremes, Semiannual Report. 1 Dec. 1966 - 31 May 1956, Contract DA-19-129-AMC-487(N).
Rhodium compounds were found to give good conversion of fluorinated dienes to polymers in aqueous emulsion systems.

Relyear, D.I.; Smith, H.P. Johnson, A.N. (U.S.Rubber Co.) Semi Annual Rept. No. 2 15 Dec 1965 Contract DA-19-129-AMC-487(N) AD 480 181
Polymerization studies on fluoro-olefins, leading to high strength, chemical resistant elastomers for service at extreme temperatures.

Secrist, D.R., Mackenzie, J.D., C.A. 65, 18701h
Glow-discharge of a fluorosiloxane polymer

$$SiF_4 + \text{dry } O_2 \xrightarrow{\text{glow discharge}} \left[-O-\overset{O}{\overset{|}{Si}}-O-\overset{F}{\overset{|}{Si}}-O-\overset{O}{\overset{|}{Si}}- \right]_n$$

Sianesi, Dario; Bernardi, Gian C. (to Montecatini Societa Generale per l'Industria Mineraria & Chemica) French Pat. 1,485,420 (Cl. C 08f); C.A. 68(8), 30380V
Polymerization or copolymerization of halogenated olefins (including C_2F_4, $CF_2=CFH$, $CF_3CF=CF_2$, $CF_3CH=CF_2$, $CF_3CH=CH_2$ CTFE, BTFE, $CF_2=CFCF=CF_2$) by means of U.V. in the presence of a macromol. perfluorinated polyperoxide,

Sianesi, D., and Caporiccio, G., Belg. 618,320. C. A. 58, 9247g (1963)
Stereopolymerization of fluoroolefins

Sianesi, D., and Caporiccio, G., C. A. 58, 9237c (1963)
Stereospecific polymerization of perfluoroolefins.

Sprynger, J.M., C. A. 65, 7301d
Radiolysis of propylene, hexafluoropropylene and acrylate.

Stamicarbon, N.V., Neth. Appl. 6,408,845, C. A. 65, 829f
Formaldehyde polymerization

Stefanovich, N.N.; Krotova, N.A. Issled. Obl. Poverleh.Sil., Sb.Dokl. Konf., 3rd 1966 (Pub.1967), 448-452 C. A. 70(10), 4853y.
Styrene and methyl methacrylate were grafted onto poly(tetrafluoroethylene) film which had been subjected to a silent discharge.

Usmanov, Kh.U.; Yul'chibaev, A.A.; Asamov, M.K. Dokl.Akad.Nauk Uzb. SSR 25(4), 24(1968).
Radiation grafting (by ^{60}Co) of vinyl fluoride to poly(methylmethacrylate) in the presence of solvents.

Valkova, E.V., et al.: C. A. 67, 22304n, Radiats.Khim.Polim., Mater. Simp. Moscow, 1964, 109-13.
Radiation polymerization of fluoroolefins.

Valkova, E.V., et al., C. A. 64, 8318a
Radiation polymerization of fluoroolefins

Volkora, E.V. and A. Shobina, C. A. 61, 5772h (1964)
Polymerization of C_3F_6 by gamma initiation in liquid and solid phases. 50 to 600 rads/sec from 263 to 195°K. Only liquids obtained.

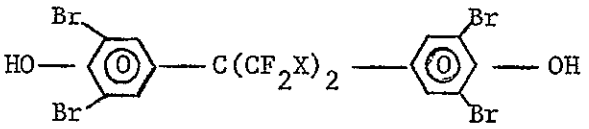
Wall, L.A. and Brown, D.W., J.Polymer Sci., Pt C (4), 1151-60 (1964); C. A. 60, 6929h (1964)
Radiation induced polymerization at high pressures. 5 to 17 x 10^3 atm at 20 to 275°, gamma dose rate 0.13 mrad to 3 mrad./hr. Polymers of $C_6H_5OCFCF_2$ and $C_6F_5OCFCF_2$.

Wilson, W., May, H., Brit. 1,022,562, C. A. 64, 17741f
Formaldehyde copolymers

II. Fluorine-Containing Monomer Synthesis and Miscellaneous Reactions

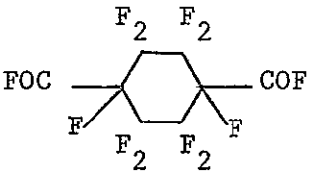
Afanas'ev, I.B.; Safronenko, E.D.; Beer, A.A. Vysokomol. Soedin, Ser. B. 9(11), 802(1967) C. A. 68 (8), 30099k
Kinetics of radical telomerization of tetrafluoroethylene with alcohols.

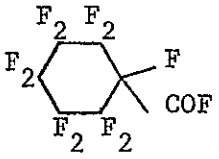
Allied Chemical Corp. Neth. Appl. 6,505,412, C. A. 64, 14131h
Prep of



H = F, Cl

Allied Chem. Corp., Neth. Appl. 6,511,438, C. A. 65, 7076e

Prep. of  and its 1,2-deriv.

Also: 

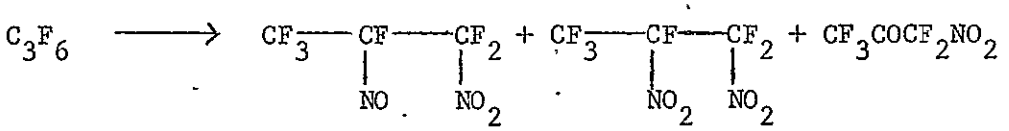
Andrianov, K.A., et al., C. A. 63, 18268d
Synthesis of trifunctional cross-linked ester acids and polyesters of regular ladder structure

Banks, R. E. Haszeldine, R. N., et al., C. A. 64, 19433a
Isomerization of the dimer of tetrafluoroallene to perfluoro-2-methyl-3-methylenecyclobutene

Banks, R. E., et al., C. A. 66, 2245p
Polyhaloallenes. Thermal co-dimerization of tetrafluoroallene with hexafluorobut-2-yne

Banks, R. E., et al., C. A. 66, 2262q
Polyfluorocyclopentadienes. Thermal dimer of perfluorocyclopentadiene perfluoro(tricyclo[5.2.1.$0^{2,6}$]deca-3,8-diene)

Bagley, E., et al., C. A. 65, 5352h



Barlow, M.G., et al., C. A. 65, 13523h
Perfluoroalkyl derivatives of nitrogen. Perfluoroalkylnitroso compounds from perfluoroacyl nitrites

Barna, P. M.: Chem. Ind. (London) 1966(49), 2054 (Eng.), C. A. 66, 37525p.
Interest in temperature-resistant polymers led to synthesis of α-(trifluoromethyl)-β,β-difluorostyrene, b_{44} 44-45°.

Bergomi, A., et al., C. A. 65, 18504h
1H- and 2H-pentafluorocyclopentadiene

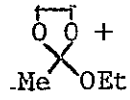
Bloechl, W., Neth. Appl. 6,414,504. C. A. 64, 3349gh
Perfluoroalkyl iodides.

Bloechl, W., Neth. Appl. 6,506,069, C. A. 64, 17421c

$$R_fI + C_2H_4 \longrightarrow R_fCH_2CH_2I + \text{Rxns. of adducts}$$

Bloechl, W., Neth. Appl. 6,511,871, C. A. 65, 3907b
Fluoroalkyl chlorosilane monomers

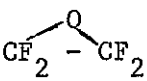
Braun, R.A., C. A. 66, 2008k
Reaction of hexafluoroacetone with orthoesters



$$+ (CF_3)_2CO \longrightarrow EtOC(CF_3)_2OCH_2CH_2O_2CCH_2C(CF_3)_2OH$$

Butler, A. J., et al. (to Dow) Fr. 1,423,584, C. A. 65, 20243d
Fluorinated monomers and polymers. Correction of pat. no. (C. A. 65, 17084h)

Caglioti, V., Lenzi, M. and Mele, A., Nature, 201(4919), 610-11 (1964); C. A. 60, 11522e (1964)

Prep. of  by oxidation of C_2F_4 with O_2

Carlson, D.P., C. A. 64, 6617e
Preparation of tetrafluoroethylene epoxide

Case, J.R. and Pass, G., J.Chem.Soc. 946-8, (1964); C. A. 60, 10533g(1964)
Pentafluorosulfuroxy derivatives of C_3F_6.

$SF_5O(C_3F_6)_nOSF_5$, n=2,3 and 4.

Castellano, J.A., et al., C. A. 64, 12589e
Aromatic polyfluoronitroso compounds

Cessna, L.C., Jr., Sternstein, S. S., Pol. Let. 3, Pt. B, 825-29 (1965)
The fracture strengths of glassy polymers. Mathematical treatment.

Cheburkov, Y.A., et al., C. A. 64, 11077c
Perfluorodimethylketone rxn. with HNO_2.

Cleaver, C. S., U. S. 2,853,531 (1958) to duPont.
Prep. of $(R)_3C\text{-}O\text{-}CF{=}CF\text{-})\text{-}CF_1,R_2,R_3$ by reaction of $(R)_3CONa$ with CF_2 HCl

Critchley, J.P.; Pippett, J.S. (Royal Aircraft Establishment, Farnborough, England) Report No. RAE-TR-68026 (Avail CFSTI) STAR (4), 625(1969) NASA Accession No. N69-14770
The products of the reaction of arylamidoximer with perfluorodiacyl chlorides were characterized anc converted into 1,2,4-axadiazolyl perfluoroolefins. Attempts to polymerize the olefins were described.

Diakin Kagyo Co., Ltd., Brit. 1,027,435, C.A. 65, 5366c
Recovery of C_2F_4 and C_3F_6 from CHClF pyrolysis

Dammont, F. P., et al., J.Pol.Sci., Pt.B, 3, 1021-3(1965)
Fluorinated diepoxides

Davis, H. R. (to 3M) U. S. 3,284,516, C. A. 66, 10568n
Reaction products of halogenated ketones with unsaturated hydrocarbons

$$(ClF_2C)_2CO + MeC{=}C{=}CH_2 \xrightarrow[18\ hrs]{140^\circ} H_2C{=}CMeC(=CH_2)C(CF_2Cl)_2OH$$

Day, R. I. (to duPont) U. S. 3,283,012, C. A. 66, 18507t
Process forpreparing perfluoroalkylethanol

$$n\text{-}C_6F_{13}CH_2CH_2I \xrightarrow[H_2O\ NaHSO_3]{25\%\ oleum} n\text{-}C_6F_{13}CH_2CH_2OH$$

Dogopol'skii, I. M., et al., Lieturas TSR Mokslu Akad. Darbei, Ser B, 1965, 95-101.
Synthesis of vinyl fluoride, using a suspended catalyst

Fr. 1,366,119 (to duPont). C. A. 62, 9313g
Perfluoropolyethers

duPont, Neth. Appl. 6,508,807, C. A. 64, 17427d

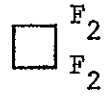
$$CCl_3CHO + HF \xrightarrow[240\text{-}260^\circ]{Activ.\ Cr_2O_3} CF_3CHO.HF \xrightarrow{NaF} CF_3CHO$$

Brit. 1,001,352 (to duPont). C. A. 64, 3791d
Fluorine-containing polymers.

duPont, Neth. Appl. 6,607,056, C. A. 65, 20028f

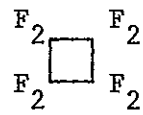
$$C_2F_4 \xrightarrow[C_2H_4]{3.8\text{ wt }\%} C_2F_4 + C_4F_8 + CF_3CF{=}CF_2 + CF_3CF{=}CFCF_3 +$$

55% 40% .026% .0013%



2.3%

duPont, Neth. Appl. 6,609,057, C. A. 65, 20028g

$$C_2F_4 \xrightarrow[\text{d-limonene}]{400\text{-}75^\circ} \text{  } + C_2F_4 + CF_3CF{=}CF_2$$

54% 45.6% .072%

E. I. duPont de Nemours & Co., Neth. Appl. 6,605,656 (Cl. C. 07e) October 31, 1966, C. A. 66, 65088s.
Preparation of perfluorodivinyl ether.

E. I. duPont de Nemours & Co., U. S. 3,282,905 (Cl. 260-89.5) November 1, 1966, C. A. 66, 85490v.
Fluorine-containing esters and polymers.

E. I. duPont de Nemours & Co., Brit. 1,033, 919 (Cl. C. 07c) June 22, 1966, C. A. 66, 65087r (1967)
Preparation of fluorinated vinyl ethers.

Dyatkin, B. L., et al., C. A. 63, 17882h
Oxydation of $(CF_3)_2C{=}NOH$ in anhydrous HF

Dyatkin, B.L., et al., C. A. 65, 5320h

$$C_3F_6 + FNO \xrightarrow[(CsF + KF)\quad 35\text{-}40^\circ]{} (CF_3)_2CFNO$$

Dyatkin, B.L., et al., C. A. 65, 12102c
Reactions of nitryl fluoride with alkyl perfluorovinyl ethers. Synthesis of α-nitroperfluorocarboxylic acid esters.

Durant, E., et al., C. A. 65, 20000h
α-Haloalkyl esters. RCO_2CHXR'

R = H, Me, CH_2X, CX_3

X = halogen

R'= H, Me, Et, iso. Pr

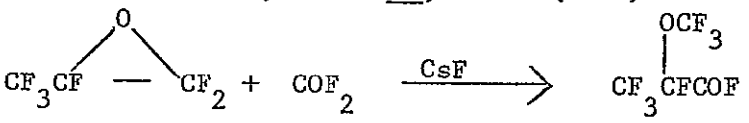
Fearn, James E. and Wall, Leo A. (National Bureau of Standards) Fluorocarbon Polymers. Polymers of perfluorohexadiene, perfluoroheptadiene, and perfluorooctadiene. (NBS-8623; AD 617256).
Perfluoro-1,5-hexadiene,perfluoro-1,6-heptadiene and perfluoro-1,7-octadiene were prepared and preliminary polymerization studies on the three monomers carried out.

Fein, Marvin M. and Green, Joseph (Thiokol Chem. Corp.), Quarterly Report No. 1, 27 Feb. 1963 - 31 May 1963, Contract DA-19-129-AMC-69(X)0.1.9044.
Nitroso rubber research, development, and production.

Firth, Wm.C.Jr., J.Org.Chem. 33(1), 441(1968) C. A. 68, 39048a
The reaction of isocyanic acid with trifluoroacetic anhydride preparation of trifluoroacetyl isocyanate.

Frisch, E.E., Fr. 1,361,255 (to Dow Corning Corp.); C.A. 61, 9401f (1964)
Preparation of perfluoroisoprene

Frits, C. G. and Moore, E.P., Fr. 1,342,515 (to E.I. duPont de Nemours and Co.); C. A. 61, 9406d (1964)



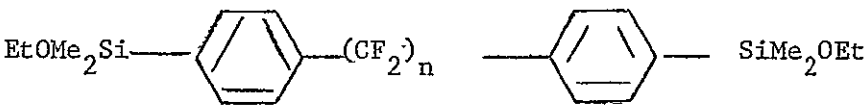
Fritz, C.G., Moore, E.P., Jr., and Selman, S., (to duPont), U.S. 3,114,778 C. A. 60,67501 (1964)
Synthesis of perfluoroalkyl trifluorovinyl ethers, including $CF_3OCF=CF_2$

Fritz, C. G., Moore, E P. (to duPont) U.S. 3,250,807, C. A. 65, 13553h
Dicarboxylic acids of fluorocarbon ethers and fluorides and their esters, amides, and salts.

Fritz, Charles G. and Selman, Stanley (to E.I.duPont de Nemours & Co.), C. A. 66, 37427h., U. S. 3,291,843 (Cl. 260-614) December 13, 1966.
Description of synthesis of fluorinated vinyl ethers.

Fuller, G. (to Imperial Smelting Corp.) Brit. 1,047,318, C.A. 66, 18585s
s-Pentafluorophenylethanol

Fuqua, S.A., and Silverstein, R.M., NASA, Doc. N63-15, 280, 39 pp (1962) C.A. 60, 741d (1964), J.Org.Chem. 29(2), 395 (1964)



Gambaryan, N.P., et al., C.A. 66, 18477h
Reactions of the carbonyl group in fluorinated ketones. A review.

Gannon, J. A. (FMC Corp.), Q. M. Elastomer Contract Progress Report 1, 26 June - 26 Sept. 1963, Contract DA-19-129-AMC-147(N).
The reaction between tetrafluoroethylene and fluoro-olefinic silanes has been shown to occur at elevated temperatures to form products containing a perfluorinated cyclobutane ring.

Ginsburg, V.A.; Vasil'eva, M.N. Zh.Obshch.Khim. 37(11), 2493(1967) C.A. 68, 95598s
The preparation and some chemical properties of tetrafluoro-ethylene oxide.

Graham,D.P., Weinmayer, V., J.O.C. 31, 957(1966)
F-initiated reactions of perfluoro α-olefins

Harris, J., McCane, D., U.S. 3,180,895. C. A. 63, 1701e
Fluorocarbon vinyl ethers. Pyrolysis of salts

Haszeldine, R.N., Brit. 963,634; C. A. 61, 13313d (1964)
Fluorovinyl oxazetidines

Haszeldine, R. N., et al., Brit. 1,014,221. C. A. 64, 8033d
Perfluorinated organic nitroso compounds

Hauptschein, M., Braid, M., U.S. 3,219,712. C.A. 64, 8031d
Telomer Iodides

Henry, J.P., Moore, L.O., (to UCC) U.S. 3,215,746. C. A. 64, 6492e
Fluoroallyl chloride

Inukai, Kan, and Hiroshige Muramatsu (Japan, Bureau of Industrial Technics), Japan 19,403 (1966) (Cl. 1613463), Nov. 10, C. A. 66, 463172.
Preparation of fluorochloro ethers and fluorochloroallyl ethers.

Isaacson, Wm.B.; et al. (3M Co) Contract No. F33615-68-1561, Interim Report No. 1 (IR-372-8(1).
Manufacturing methods and processes to produce difunctional perfluorinated monomers; e.g. $NC(CF_2)_nCN$ and $NCCF_2O(CF_2)_nOCF_2CN$.

Henry, J.P., Moore, L. O., (to UCC) U. S. 3,215, 746. C.A. 64, 6492e
Fluoroallyl chloride

Inukai, Kan, and Muramatsu, Hiroshige, (Japan, Bureau of Industrial Technics), Japan 19,403 (1966) (Cl. 1613463), Nov. 10, C. A. 66, 463172.
Preparation of fluorochloro ethers and fluorochloroallyl ethers.

Janz, G. J., Flannery, J. B., C. A. 65, 7013f

$$CF_3CN + CH_2{=}CHF \longrightarrow CF_3CH_2CHFCN + 13\% \text{ higher}$$

Johnson, R. L., Burton, D. J., C. A. 64, 4240f
Gas Chromatographic analysis of some polyfluorinated alicyclic olefins.

Kato, Kaoru; Wade, Hiroyuki; Kawakami, Yasumasa. Japan 68 07,202 (Cl. 16 B 211). C. A. 69, 58822k
Production of vinyl fluoride and 1,1-difluoroethane from acetylene.

Katsushima, Atsuo; et al. (to Daikin Kogyo Co. Ltd.) Japan 67 21,331 (Cl 16B 81) C. A. 69(4), 11065a.
Fluorine-containing polyisocyanates from R_fROH and organic polyisocyanates.

Kirk-Othmer Encycl. Che. Technol., 2nd Ed., C. A. 65, 13534h.
Fluorinated carboxylic acids

Knunyants, I.L., et al., C. A. 65, 8749b
Nitration of C_3F_6 by NO_2 and a study of the nitration products.

Knunyants, I.L., et al., C. A. 65, 10482b

$$(CF_2)_n(CONHNH_2)_2 \xrightarrow[(2)\quad \Delta]{(1)\quad HNO_2} (CF_2)_n(NCO)_2$$

n = 3,4

Knunyants, I.L., et al., C. A. 65, 12100h
Fluorinated monocarboxylic acids

Kopnova, N. L., et al., C. A. 64, 6677c
Synthesis of fluorine-containing silanes with reactive atoms of groups at Si

Kresta, J., Ambroz, L., C. A. 65, 15514g
Study of the physiochemical properties of vinyl fluoride

Kureha Chem. Ind. Co., Japan, C. A. 64, 3349g
Vinylidene fluoride

Lawlor, F.E. et al, U.S. 3,129,250 (to Pennsalt Chemicals Corp.); C. A. 61, 2974c (1964)
Preparation of $CF_3(CH_2)_xOCH{=}CH_2$ by pyrolysis of the corresponding acetal.

Lester, G. R., Adams, C. J. (Univ. Oil Prd. Co.)
U. S. 3,274,273, C. A. 66, 10551g
Dehydrohalogenation of halo hydrocarbons. Catalyst of oxide of Mg, Ca or Zn plus oxide Cu or Ce

Linn, W. J. (to duPont) U. S. 3,271,419
Fluoro-containing lactones and unsaturated acids.

Lovejoy, E., et al., C. A. 62, 9304f
Irradiation of fluorine-containing polymers

Madai, H., East Ger. 42,730, C. A. 64, 17421b

$$CH_3Cl + CF_2Cl_2 \xrightarrow{500^\circ - 1100^\circ} CH_2CF_2,\ C_2F_4,\ CF_2HCHClCF_2H,\ \text{etc.}$$

Manno, P. J., Snavely, W. H. (to Continental Oil Co.) Ger. 1,210,799.
Prep. of vinyl fluoride from C_2H_2 or CH_3CHF_2

Martynov, I. V., Kruglyak, Yu, L., C. A. 64, 8022g
Halo-α-nitrocarboxylic acids

Mashburn, T. A. (to duPont) U. S. 3,257,466 C. A. 65, 13544e
Linear dimers of perfluoro(alkylvinyl ethers)

Mastrangelo, S.V.R., (to duPont) U. S. 3,228,864

$$\underset{\substack{96.4\\ \text{mole \%}}}{C_2F_4} + C_2H_4 \xrightarrow{h\nu} CF_2 + F + \underset{47.4\%}{\text{polymer}}$$

$$CF_2 = CF_2$$
51.7%

Mazalov, B.I., et al., C. A. 66, 10545n
Reaction of some derivatives of ω,ω,ω-trichlorohexafluoro-valeric acid with copper

$$CCl_3CF_2CF{=}CF_2 \xrightarrow{Cu} \text{polymer + dimer}$$

McBee, E. T., et al., J.O.C. 30, 3698(1965)
Reaction of amines with cyclic fluorinated olefins

Mitsch, R. A., Neuvar, E. W., C. A. 64, 11049a
Perfluoro(vinylcyclopropane) and perfluoro(allylcyclopropane)

Miville, M. E., Earley, J. J. (to Pennsalt)
U.S. 3,246,041, C. A. 64, 19410e

$$CH_3CF_2Cl \xrightarrow{\Delta} CH_2{=}CF_2$$

Mod, W. A., et al. (to Dow) U. S. 3,278,406, C. A. 65 20004f

$$CF_2H_2 + Cl \xrightarrow[\text{low temp.}]{\text{U. V.}} C_2F_4 \quad \begin{matrix}89.6\%\ \text{conv.}\\ 46.9\%\ \text{yield}\end{matrix}$$

Mod, W. A. (to Dow) U. S. 3,278,616, C. A. 66, 2182z
Tetrafluoroethylene from difluoromethane

$$CH_2F_2 + Cl_2 \xrightarrow[50\text{-}500^\circ]{\text{Cat.}} CF_2{=}CF_2$$

Montecatini Edison S.P.A. British 1,130,836 (Cl. C 08f) C. A. 70 (2), 4795f.
Oxidation of C_2F_4 with O_3-containing oxygen gives tetrafluoroethylene epoxide and poly(oxyperfluoromethylene) in net yields of 46% and 18.7%, resp.

Montecatini, Neth. Appl. 6,504,428, C. A. 64, 14360g
Prep. of $CF_3\overline{CFCF_2O}$

Montecatini, Brit. 1,020,716, C. A. 64, 15740c
Prep. of vinyl fluoride from CH_2=CHCl

Moore, E. P., (to duPont) Fr. 1,362,548. C. A. 62, 7897b
Reaction of R_fCOF with $CF_3\overline{CFCF_2O}$

Moore, E.P., Milan, A. S. (to duPont) Brit. 1,019,788
Fluoroketones and fluoroalkanoyl fluorides

Moore, E. P., et al. (to duPont) U. S. 3,250,808
C. A. 65, 13554b
Fluorocarbon ethers from hexafluoropropylene oxide

Mueller, R., Reichel, S., C.A. 64, 6677f
Fluorination of $(Cl_3Si)_3CH$, $(CL_3Si)_3CCl$, $(CL_3Si)_4C$, and the synthesis of certain corresponding organopentafluorosilicates.

Mueller, R., Dressler, M., East Ger. 43,698, C. A. 65, 7057a
Prep. of CTFE by dechlorination of $CF_2ClCFCl_2$

Muramatsu, H., et al., C. A. 64, 15723a
Synthesis of fluorine-containing dienes

Muramatsu, H., et al., C. A. 65, 3723c
Synthesis of fluorine-containing butadienes

Neth. Appl. 6,414,768. C. A. 64, 3481g
Fluorine-containing epoxides

Neth. Appl. 6,506,200 (to duPont). C. A. 64, 11083g
$(CF_3)_2CHCl \xrightarrow{725+^\circ} CF_2$=$CFCF_3$

Noguchi, H., et al., Pol. Let. 3, 271(1965)
CH_2=$C(OEt)_2$

Park, J.D., and Lacher, J.R. (Colorado U., Boulder), The Synthesis of Special Fluorine-Containing Monomers, Quarterly Report No. 8, 1 Jul. - 1 Oct. 1963, Contract DA-19-129-QM-1926.
Synthesis of new olefins and diolefins; preparation of fluorinated carbocyclic and heterocyclic three-membered rings and others.

Park, J.D. and Lacher, J. R. (Colorado U., Boulder) Fifth Quarterly Progress Report, Oct. 1 1962 - Jan. 1 1963, Contract DA-19-129-QM-1926.
Rubber Research. The synthesis of special fluorine-containing monomers.

Park, J.D., Cook, E. W., C. A. 64, 12513a
Stereochemistry of nucleophilic substitution of unsaturated fluorocarbons.

Park, J.D. and Lacher, J.R. (Colorado Univ., Boulder) The Synthesis of Special Fluorine-Containing Monomers, Final Report 1 Oct. 1963 - 1 Oct. 1965, Contract DA-19-129-QM-126
Various α,ω-diolefins included.

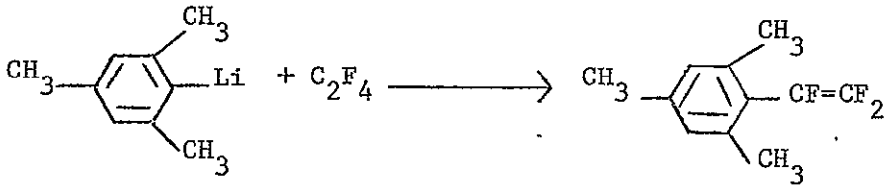
Park, J.D. and Lacher, J. R. (Colorado Univ., Boulder) The synthesis of Special Fluorine-Containing Monomers, Semiannual Report June 1 - Dec. 1, 1966, Contract DA-19-129-AMC-869(N).
Further work on synthesis of fluorine-containing olefins and diolefins is reported.

Park, J. D. and Lacher, J.R. (Colorado Univ., Boulder) The Synthesis of Special Fluorine-Containing Monomers, Semiannual Report, 1 Dec. 1966 - 1 June 1967.
Research on fluorine-containing olefins and diolefins, dimerization reactions producing dibox compounds.

Pennsalt Chemical Corp., Vinylidene Fluoride, Neth. Appl. 6,508,619 (Cl. C. 07c), January 6, 1967, Appl. July 5, 1965, C. A. 67, 11182v.
$CH_2=CF_2$ is prepared in good yields at lower temperatures from $MeCF_2Cl$ in the presence of a small amount of Cl.

Pennsalt, Neth. Appl. 6,512,899, C. A. 65, 5366d
Prep. C_2F_4 and C_3F_6 by pyrolysis of HCF_3

Petrii, O. P., et al., C. A. 64, 19462d



Pittman, A. G., Sharp, D., C. A. 63, 559e
Fluoroalkyl glycidyl ethers from fluoroketones

Pittman, A.G., Wasley, W. L., Neth. Appl. 6,512,238, C. A. 65, 7362g
Fluoroesters with ketone group

Pittman, A. G., et al., C. A. 65, 17056d
Polymers derived from fluoroketones. Preparation of fluoroalkyl acrylates and methacrylates.

Pittman, Allen G.; Sharp, Dennis L.; Ludwig, Barbara A. J.Polymer Sci.Part A-1 6(6), 1729 (1968)C.A. 69(2), 3267c
Polymers derived from fluoroketones II wetting properties of fluoroalkyl acrylates and methacrylates.

Pittman, Allen G.; Wasley, Wm.L. U.S. 3,382,222 (Cl. 260-91.1) C. A. 69(4), 10962d.
Fluorinated allyl ethers and their polymerization.

Posta, A., Paleta, O., C. A. 65, 3724h
The addition reaction of CCl_4 to CTFE

Prager, J.H. and Thompson, P.G., J.Amer.Chem.Soc., 87(2), 230(1965)
Prep. of fluorocarbon hypofluorites

Produits Chimiques Pechiney-Saint-Gobain, Fr. 1,453,455, (Cl. C. 08f), September 23, 1966, C. A. 66, 95827z.
Fluorination of organic polymers.

Proskow, S., U. S. 3,121,734 (to E. I. duPont de Nemours and Co.); C. A. 60, 10557b
Prep. of $NCCF_2CF_2CN$

Pummer, W. J., Wall, L.A., C. A. 65, 5390f
Pentafluorophenyl alkyl and vinyl ethers

Rabinowitz, R., U.S. 3,225,106, C. A. 64, 8078h
Process for prep. terminal halogenated olefins

Ray, N.H., Brit. 982,214. C. A. 62, 10340b
$CH_2=CHSF_5$ by dehydrohalogenation with cyclohexylamine

Riera, J., Stephens, R., C. A. 65, 18506a
Fluorination of aromatic polyfluorocompounds. Could be used as a route to difficultly accessible polyfluoroolefins.

Ruff, J.K., et al.
Synthesis of fluoroxyperfluoroalkyl compounds.

$$XYC{=}O + F \xrightarrow[KF,\ CsF,\ RbF]{-78^\circ} XYFCOF \qquad X \& Y = F \text{ or fluoroalkyls}$$

Salinovich, O., et al ., C. A. 65, 11747a
The gas phase fluorination of carbonyl sulfide

Saunders, D., Heicklen, J., C. A. 65, 3731d

$$O(3p) + C_2F_4 \longrightarrow CF_2O$$

$$O(3p) + C_3F_6 \longrightarrow CF_2O + CF_3CFO$$

Schecter, H., Conrad, F., J.A.C.S., 72, 3371 (1950)
CF_3CHO

Scherer, O., et al., C. A. 65, 5375h
Prep. and rxns. of perhalogenated α,β-unsaturated ketones

Scherer, Otto; Rammelt, Peter P. Ger. 1,265,732 (Cl C 07c)
C. A. 69(9), 35481j
Purification of CF_3COF: crude material, containing HCl & HF, is bubbled through 65% oleum, condensed, and distilled, b.p. -61 to -57°.

Sedlak, J. A., et al., U. S. 3,207,797. C. A. 63, 17963h
Prep. of α-fluorostyrene

Sedlak, J. A.,Matsuda, K., (to Am. Cy.)
U. S. 3,262,967, C. A. 65, 12112a
α-fluoroacrylates

Selman, S. (to duPont) U.S. 3,274,239, C.A. 65, 20029a
Perfluorocarbonyl compounds + perfluoropropylene oxide + $RO[CF(CF_3)CF_2O]_nCF(CF_3)COF$ n = 0 to 6

Shen, M., Tobolsky, A. V., C.A. 63, 5872a
Thermoelasticity and chain configuration of rubber-like net work polymers.

Shokina, V.V. (Army Missile Command, Huntsville, Ala.), Linear Polyfluorinated Analogously Bifunctional Compounds as Potential Monomers, Transl. into English from Usp. Khim. (USSR). 32(9), 1052-86 (1963)
Production methods and properties of potential monomers for the production of new fluorine-containing polycondensation polymers.

Sianesi, D., et al., C. A. 64, 6474f
Fluoroolefins III. The synthesis of $CF_2=CHCF_3$

Sianesi, D., et al., C. A. 65, 7004e
The chemistry of hexafluoropropylene epoxide

Slichter, W.P., Davis, D.D., Rubber Chem. and Tech., 38, 3517(1965)
NMR studies of molecular motion in some elastomers

Societa Edison, S.p.A. -Settore Chimico, Neth. Appl. 6,516,825, C.A. 65, 20099c
Tetrafluoroethylene oxide $O_2 + CF_2=CF_2 \xrightarrow{\text{Ag cat.}}$

Tarrant,Paul; Perry, Doug; Tandon, Jai; Wright Alan; and Misaki, Susumu (Univ. of Florida, Gainesville), Research on Synthesis of Unsaturated Fluorocarbon Compounds, Semi-annual Report, April 1 - September 30, 1965, contract DA-19-129-AMC-79(N).
Progress is reported in preparation of unsaturated organic compounds containing fluorine.

Tarrant, Paul, et al. (Univ. of Florida, Gainesville), Research on Synthesis of Unsaturated Fluorocarbon Compounds, Army Natick Lab., Mar. 1967, Contract DA-19-129-AMC-79(N).
Synthesis of a variety of fluorine-containing compounds including some fluorinated dienes.

Tarrant, Paul: C. A. 68, 93047n, U. S.Clearinghouse Fed. Sci. Tech. Inform., AD 662712, Research on Synthesis of Unsaturated Fluorocarbon Compounds.
A series of F monomers were prepared including several new fluorinated nitroso monomers.

Tatlow, J.C., et al., C. A. 65, 5350c
Reductive coupling of perfluorovinylhalides in the presence of copper-bronze

Tedder, J. M., Walton, J.C., C. A. 65, 2107a
Addition of trichloromethyl radicals to fluoroethylenes

Thiokol Chemical Corporation, U. S. 3,300,538 (Cl. 260-653.3), January 24, 1967, C. A. 66, 75647r.
Purification of perfluoro and chloroperfluoro olefins.

Timofeyuk, G. V., et al., C. A. 65, 8947b
Synthesis of para-substituted α,β,β-trifluorostyrenes

Trasick, R. W. (to duPont) U. S. 3,239,557, C. A. 64, 14098c

Prep. $Z(C_nF_{2n})CH_2CH_2O\overset{O}{\overset{\|}{C}}R$

Z = F or $R\overset{O}{\overset{\|}{C}}-OCH_2CH_2$

R = alkyl or alkenyl
n = 1-16

Tumanova, A., et al., C.A. 63, 478f
Prep. of $CF_3OCF_2CF_2X$ X=I, Cl, Br

UCB (Union Chimique - Chemische Bedrijuen), S.A., C. A. 67, 63829f, Neth. Appl. 6,609,240 (Cl. C. 07c), January 9, 1967.
Unsaturated fluorinated diesters.

Belg. 658,186 (Union Carbide). C. A. 64, 8031h
Ferric oxide catalysts for chloroalkane to fluoroalkane conversion.

Usmanov, Kh.U. et al. Nauch. Tr. Tashkent. Gos.Univ. 1967, No. 284, 117-22 C. A. 69(9), 35310c
Synthesis of vinyl fluoride

VEB Fluorwerke Dohna., East Ger. 43,244, C. A. 64, 19408h

$$CHClF_2 + CHClFCF_3 \xrightarrow[Pt]{800^\circ} C_3F_6$$

Wall, L. A., Antonucci, J.M. (to U.S.Dept. of Navy) U.S. 3,265,746, C. A. 65, 13602b
Perfluorostyrene

Wall, Leo A.; Antonucci, Joseph M. (U.S.Dept.Navy) U.S. 3,394,190 (Cl.260-609) C. A. 69, 58939d.
Preparation of perfluoro-p-cresol and perfluoro-p-thiocresol. Polymers are obtained by heating with mild alkali.

Warnell, J. L., (to duPont) French 1,410,444.
Perfluorovinyl ethers

Warnell, J. L. (to duPont) U. S. 3,250,806, C.A. 65, 15230f
Fluorocarbon ethers of tetrafluoroethylene oxide

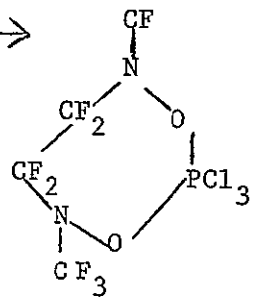
Warnell, J. L. (to duPont) U.S. 3,277,169, C. A. 66,11304r
Fluorocarbon-hydrocarbon polyethers. Hexafluoropropylene oxide, or tetrahydrofluoroethylene epoxide with ethylene oxide, propylene oxide, oxetane or tetrahydrofuran

Yakobson, G. G., et al., C.A. 64, 1424h

Prep. of HO_2C—C$_6$H$_4$(F)—CO_2H and esters

Yakubovich, A.Ya., et al., C. A. 64, 14079c

$$C_2F_4 + PCl_3 + 2CF_3NO \longrightarrow$$



Yakubovich, A.Ya., et al., C. A. 65, 12205c
Syntheses in the 1,3,5-triazine series. Esters of iminoperfluorocarboxylic acids; synthesis, properties, mechanism of cyclopolymerization into 1,3,5-triazine derivatives.

Yakubovick, A. Ya.; Belyaena, I.N.; Gitel, P.O.; Smolyanitskaya, V.V.; and Sankina, L. V.: C. A. 67, 63660u, Zh. Obshch. Khim. 37(4), 847-52 (1967) (Russ.)
Reaction of direct fluoroalkenylation. V. Fluorovinyl alkyl ethers and fluorovinyl alkyl thio ethers. Synthesis and polymerization of the ethers is given.

Yarwood, J., Orville-Thomas, W. J., J.Chem.Soc. 7481(1965)
IR and Raman spectra of CCl_2=CFH.

VIII. Vulcanization of Fluorine-Containing Polymers

Acker, Donald S. and Arthur L. Barney (to E.I.duPont de Nemours & Co.) U.S. 3,378,604(Cl.260-874) C.A. 68, 115548f
Vulcanizable composition containing a thiocarboxylic acid fluoride polymer and a polyunsaturated compound, e.g. poly(thiocarbonyl fluoride) with divinylbenzene.

Gilinskaya, N.S., et al., C. A. 64, 900c
Vulcanization of fluorine-containing polymers using Schiff bases.

Goldsmith(to Gen.Plastics Corp.) U. S. 3,281,511, C.A. 66, 3358f
Process for increasing tensile strength and flexing of poly(TFE).

Griffin, Warren R., Library of Congress Science and Technology Div., Washington, D. C., Charles J. Cleary Awards for papers on material sciences, 1962, p. 125-135, 14 refs.
A room temperature vulcanization system for selected fluorine-containing polymers. Test data are given for a hexafluoropropylene-vinylidene fluoride copolymer.

Honn, F. J. and Sims, W. M. (to 3M Co.) U. S. 3,318,854, C. A. 67, 22731z
Vulcanization of CTFE-VF_2 copolymers.

Lanza, V. L., Belg. 670,761, C.A. 65, 13925h
Vinylidene fluoride polymers cross-linked with trialkyl cyanurate

Nagelschmidt, Rudolf and Goecke, Max, Deutsche Gold and Silber-Scheideanstalt, Ger. 1,234,983 (Cl. C. 98g), February 23, 1967.
The condensation products of aldehydes or ketones with polyamines and polyisocyanates are used as crosslinking agents for halogen-containing polymers.

Nodar-Blanco, A.; Yarsley Research Labs, Ltd. (Gt.Brit) Report No. D-MAT-150; AD-669684 (USGRDR) NASA AD No. N68-29746.
Vulcanization of fluorine-containing elastomers.

Novikov, A.S., et al., FTD-TT-65-1371
Study of vulcanization of fluoro-copolymers with polyamines by IR spectroscopy method

Novikov, A.S., et al., C. A. 62, 9329c
Study of cure of fluorine-containing elastomers with Shiff bases.

Nonikov, A.S.; Stolyarova, L.G.; Gilinskaya, N.S.; Galil-Ogey, F.A.; and Nudel'man, Z.N.: C. A. 68, 79342y, Kauch. Rezina, 26(10), 21-4 (1967) (Russ.).
Vulcanizing fluoroelastomers by alkali metal derivatives of bisphenols.

Sands, George D. and Pezdirtz, George F. (NASA Langley Research Center) Cross-linking of polyvinylidene fluoride by gamma radiation. Presented as the 150th National Meeting of the American Chemical Society, Atlantic City, 12-17 September, 1965.
After polymer was irradiated, tensile strength was found to increase, which is typical of polymers undergoing crosslinking. Elongation was found to decrease.

Smith, F., Albin, J., C.A. 63, 7186e
Vulcanization of fluoro elastomers with difluorodiazine

Terentseva, A.P., et al., C. A. 63, 15079d
Vulcanization of fluoroorganic elastomers

Yarsley Research Laboratories, Ltd.(by A.W. Flavell & A. Nodar-Blanco) Brit. 1,095,836 (Cl. C 08f) C. A. 68, 40795y
Curing fluoro-rubbers; trialkylquaternary ammonium salts to cure.

Yarsley Research Laboratories Ltd. (Arthur W. Flanell, Angel Nodar - Blanco), C.A. 68, 40795y., Brit. 1,095,836 (Cl. C. 08f), December 20, 1967.
Curing of fluoro-rubbers. Trialkyl quaternary ammonium salts were used as curing agents for vinylidene fluoride-Hexafluoropropene copolymers or vinylidene fluoride-Hexafluoropropene-tetrafluoroethylene terpolymers.